PRINCIPLES OF ADVERTISING.

"The time will come when it will not be considered a matter of square dealing for a newspaper to refuse to give information as to the extent of its circulation, which is the accurate measure of its usefulness for advertising purposes."—*Exchange.*

That time has come now with the great mass of reputable and well-established newspapers. But there are a few which feel it necessary to attract trade by a constant display of figures to the general public, or by a parade of notoriously false assertions. Both these practices are of the nature of Cheap John business. Persons who seek the columns of a newspaper for advertising purposes are entitled to know precisely what they are paying for, but we know of no one else who is so entitled. That is the principle of business in all trades. A man who should be constantly prating of his commercial soundness, or drawing diagrams of the wonderful extent of his trade, would be liable to be looked upon with suspicion, and very justly so. As a matter of fact there are but few, very few, newspapers of any standing and character which have ever attempted to conceal the extent of their circulation from those who, for business reasons, are entitled to know it, just as there are few, very few, papers which feel it necessary to proclaim from the housetops a fact which, if a fact, is known to every intelligent, wide-awake and enterprising advertiser. It is only the gudgeons in business who are swindled into advertising in alleged newspapers without circulation or influence. A merchant with intelligence enough to conduct his own business knows what newspapers in his town or city enjoy the circulation and influence that warrant him in paying for them.

But there is a fallacy in the paragraph quoted, and which is one of the stock arguments of a few newspapers, and that is the assertion that the number of copies printed or circulated is the only gauge whereby to test its value as an advertising medium, "the accurate measure of its usefulness for advertising purposes." It does not require a moment's careful thought to see the utter falsity of such a proposition. The extent of circulation is but one factor to be considered, and sometimes it may be the very smallest. The character of the circulation, the character of the paper, the standing it has in the community to be reached by the advertiser, are all to be taken into account by the sagacious merchant. There are newspapers which circulate widely, more widely than any other, in whose columns a reputable business should not be advertised, and if it were it would reach but the smallest possible number of people who would be likely to become customers. As a rule, in all cities the low-priced, cheap papers, which necessarily print the largest number of copies, circulate most widely among classes in which customers are not found for a very considerable percentage of business houses. The newspaper which is the best advertising medium for general business is that one of established character, good repute in the community which covers its field satisfactorily, and reaches the largest number of those classes of people from whom such business expects to and does draw its custom. These facts are recognized by all prudent and intelligent men; they are practiced upon by advertisers who study the science of advertising, and particularly are they emphasized in the advertising of specialties in what are known as class newspapers, the circulation of which is necessarily limited, but which at the same time, reach the larger percentage of people who are interested in the specialty. A high-grade book publishing house for instance, would show singular judgment to advertise in the *Police Gazette* rather than in the *Nation*, simply because the *Gazette* may print many fold more copies than does the *Nation*; and so would a wholesale house or a first-class dry goods establishment display equal ignorance of the fundamental laws of advertising by giving its patronage to papers which find their principal sale on the streets and among transient classes, with domestics and those in search of employment and in the exchange of labor, rather than in papers which are circulated among the business classes throughout the locality which is tributary to the wholesaler, and which go into the homes of the resident people of the community whose patronage supports the first-class retailer. These facts, which are at the base of all judicious and valuable advertising, the *Journal* can afford to state plainly, without suspicion of interested motives, because it is universally known that while this paper enjoys in a good degree the confidence and esteem of the community, and reaches the best classes of the people in the territory it aims to serve, it also enjoys the largest circulation, as a mere question of the number of copies printed, of any morning daily published in the State. But the principles are nevertheless true and apply to all newspapers, wherever they may be published.—*Indianapolis Journal.*

P-STREET BRIDGE.—C. A. Schneider's Sons, of that city, have been awarded the contract for repairing the P-street bridge over Rock Creek, Washington, D. C., for the sum of $2,482.48.

THE HISTORY AND STATISTICS OF AMERICAN WATER-WORKS.

BY J. JAMES R. CROES, M. AM. SOC. C. E.

(*Continued from page* 201.)

DXXIX.—LANSFORD, PA.

Lansford, Pennsylvania, in lat. 40° 48′ N., long. 72° 12′ W., on Panther Creek, a tributary of the Schuylkill River, is in a valley of the Lehigh Mountains, on irregular ground. The mountains are 400 to 500 ft. high and about a mile apart, with undulating ground between. Settled in 1847, it was incorporated a borough in 1877.

Water-works were built in 1873 by the Lehigh Coal and Navigation Company, after plans of W. D. Zehner, taking the supply from mountain streams on Broad Mountain, three miles north of the town. A dam forms an impounding reservoir, covering two acres and containing 500,000,000 gallons at 200 ft. above the town. The water is conveyed to the town in cast-iron pipe of from 12 to 8 in. diameter, and is distributed through 6¼ miles of cast-iron pipe of 6 to 3 in. diameter, with 2 fire hydrants and 25 taps. There are no public fire hydrants in the town. Service pipes are of plain wrought iron. The population in 1880 was 2,206. The daily consumption is not known.

The works cost $73,751. The expenses in 1882 were $1,039.82. The water rent for consumers is 50 cents per month. The works were built for the use of the company in operating their mines.

W. D. Zehner is the Superintendent.

DXXX.—CARLETON, N. B.

Carleton, New Brunswick, in Canada, in lat. 46° N., long. 64° W., on the River Saint John, is on uneven ground, in a rocky district. It was settled in 1783, and incorporated a city in 1785.

Water-works were built by the city in 1860, after plans of Hurd Peters and J. Edward Boyd, civil engineers, taking the supply from Spruce, Ludgate and Menzie lakes, which have a water surface of four square miles, six miles from and about 130 ft. above the city.

There is an earthen dam at the outlet of the lakes, and the water is passed in part through a filter of gravel. No description of the filter is given. The water is conveyed by six miles of 12-in. cement-lined wrought-iron pipe, to a reservoir, in excavation and embankment, 160 × 180 ft. and 20 ft. deep, holding 3,000,000 gallons.

Distribution is by five miles of cement-lined wrought-iron pipe of 8 to 3 in. diameter, with 26 fire hydrants, 25 gates and 360 taps. Service pipes are of lead and iron. Considerable trouble has been experienced with the distribution pipe, partly from freezing, and in some cases from settlement on made ground.

The population in 1880 was 5,000. The daily consumption in 1882 was 300,000 gallons.

The works cost $131,000, which is the bonded debt at 6 per cent. interest. Further financial statements are not given.

The works are managed by three commissioners appointed by the City Council. George F. Harding is the Chairman and J. Alfred Ring the Superintendent.

DXXXI.—MONCTON, N. B.

Moncton, New Brunswick, in Canada, is on the Petticodiac River, in lat. 46° 10′ N., long. 60° 40′ W. Settled in 1770, it was incorporated in 1855 and a city in 1875.

Water-works were built in 1878 by the Moncton Gas Light and Water Company, after plans of Gilbert Murdoch and E. H. Keating, and under the superintendence of W. J. Croasdale, C. E., taking the supply from the Northwest branch of Hall's Creek, where an earth dam 35 ft. high, founded on rock, with puddle core 15 ft. wide at bottom and 10 ft. at top, forms a reservoir 2 miles long and 400 ft. wide at 135 ft. above the city, to which the water is conveyed in a cast-iron main from 20 to 12 in. diameter. The distance from the town is not given.

Distribution is by 20 miles of cast-iron pipe of 12 to 4 in. diameter, with 27 fire hydrants and 251 taps. The government railway works are also supplied with water. The mains of 12 in. diameter and over are calked with wood. Those of 8 in. diameter were made in Scotland, and have turned and bored joints. Service pipes are of lead and of wrought iron. The city pays $75 per year each for 15 hydrants and $50 each for the rest. The capital stock of the company is $100,000. It furnishes gas and water and pays 20 per cent. dividends, besides providing for extensions of the works out of the profits. The water-works cost $80,000. The bonded debt is $40,000 at 6 per cent.

The population in 1880 was 5,032. The daily consumption is not given.

J. L. Harris is the President and Manager, and C. P. Harris, Treasurer.

The receipt of statistics as follows is acknowledged with thanks:

From W. D. Zehner, Superintendent, statistics of Lansford, Pa., water-works.

From G. F. Harding, Chairman W. Com., statistics of Carleton, N. B., water-works.

From C. P. Harris, Treasurer, Statistics of Moncton N. B., water-works.

NO WATER-WORKS.

New Hartford, N. Y.—R. W. Sherman states that the village having voted against a contract with the Water Co. by a tie vote, no works have been built.

Warren, Ohio.—Geo. H. Tayler, Sec. Warren Gas Light Co., writes:

"About five years ago a charter was obtained and a company formed to erect water-works here. The city granted certain rights by ordinance.

The company placed its bonds in the market in the East, but failed to sell them. The works were never built, and the city has repealed the ordinance. I suppose the water-works world generally supposes there is a works here."

Reynoldsville, Pa.—R. M. Boyle, M. D., *Burgess* writes: "Reynoldsville has no water-works; never had, and from present outlook never will have."

The above named towns have been in printed lists of water-works for some years, but, as will be seen from these letters, without reason.

EXPLOSIVE COMPOUNDS.

Professor Abel, C. B., the British Government chemist, lectured at the Royal United Service Institution on Friday, 16th ult., on the most recent processes in the production and application of explosive compounds. Mr. Spottiswoode, F. R. S., presided, and there was a very large audience.

Professor Abel remarked that, notwithstanding the progress which had in recent years been made in the manufacture of gunpowder, the strides made in discoveries regarding other explosives were even more remarkable. In dealing with gunpowder, the density of the powder had to be taken into consideration as well as the mechanical division of the substances, and he pointed out that gunpowder could be made to vary considerably as regarded the time occupied in burning, while the manufacturers had opportunities at the present time of carrying this out to the utmost. He practically illustrated his statement by igniting three kinds of gunpowder, which exploded with varying rapidity, and then proceeded to say that in late years the authoritities had been led to make modifications in the construction of artillery—had been led back, in point of fact, to the system of breech-loading, as affording not only very improved means of dealing with powder in its more modern form, but facilities which it would have been idle to expect a few years ago. In 1879, when the size of the powder had been increased from the size of what was known as the ordinary pebble to that of the large pebble, it was thought that very remarkable results had been obtained; but in 1882 much more marvellous results were to be seen, and they had succeeded in obtaining a velocity of no less than 2,000 feet a second. Attention had of late years been turned to other applications of explosive agents. It had always been an object of consideration in the service to obtain a more violent explosive than gunpowder, for it was felt that more destructive power than could be obtained by the use of ordinary gunpowder was needed. In the Crimea, the shell powder was almost any powder, but subsequently it was found desirable to use finely ground powder. The Austrian Government for a time turned their attention to experiments on gun-cotton soon after its discovery and endeavored to utilize it in shells. But in 1863 the investigation was handed over to England, the Austrians having found that the experiments had been attended not only by great expense but by serious loss of life. The English Government then turned serious attention to using gun-cotton for shell purposes. Experiments were made, and the authorities succeeded in firing three shells containing gun-cotton from mortars with perfect safety, but when they came to fire a shell from a smoothbore gun the shell burst, with very disastrous results. Since this time England had proceeded much further in the application of gun-cotton to shells, and with great success. There was necessarily great difficulty experienced in dealing with explosives which were more violent in their action than gunpowder, and yet more sensitive in their nature, and by converting a granulated powder into a hard, solid mass the nature of the explosive might be said to be entirely changed. He maintained that up to the present the Government had not had the moral courage to ascertain to what extent gun-cotton could be used as an explosive agent in shells, and they had never gone so far as to fire the white gun-cotton yet. Foreign countries were beginning to move rapidly in these directions, and it was a well-known fact that experiments were being made in various foreign States as to more deadly explosives. Passing to the question of substitutes for powder in small arms, he said that as far back as he could remember experiments had been made with the view of obtaining some substitute for powder in small-arm guns. A very important use of explosives was their application to mining and blasting

purposes, where it was not desirable to limit the explosive power, but to get the *maximum* force. During the last ten years immense strides had been made in this subject, and various kinds of explosives had been developed. Gun-cotton, of course, would burn much more rapidly than gunpowder; and to prove this the lecturer put some grains of gunpowder in some gun-cotton and ignited the latter, when it was destroyed, but the gunpowder remained untouched. There was, Professor Abel continued, a remarkable difference in the way explosive character was developed, and a great difference in the explosive character might be caused by very simple means. To prove this he inserted a red-hot iron through a cake of damped gun-cotton, and thus proved that it was quite harmless. A great difference in the nature of this explosive might be caused by a slight difference in its mechanical conditions, and it would now burn very rapidly and again comparatively slowly. There was no strict line between detonators and explosives; it was merely a question of degree. Very powerful effects could be produced by the addition to gun-cotton of very small quantities of fulminate of mercury. He wished to say a word or two about nitro-glycerine. This substance was at first regarded merely as a chemical curiosity, but it was found soon that nitro-glycerine could be applied more readily and with better results than gun-cotton. There were many ways of detonating this, but it was more difficult to do this in a liquid form, because the particles would shrink, and must be made to resist motion. At first this was found to be a very serious difficulty, but when it was discovered that the substance could be diluted, and was not the least affected, but that by this means the difficulties caused by its liquid nature could be overcome, then nitro-glycerine became a most important explosive, and in the form of dynamite it had become one of the most formidable and valuable explosives with which people were acquainted. Dynamite was the name given to this mixture, and since it had been produced a variety of substances of a very similar nature, but with different names, had been produced. It was known as giant-powder in America, and in other parts as vulcan-powder, lithofractor, pectralite and other names. Perhaps, however, the most effective explosive known was blasting gelatine, which had very remarkable properties. In summing up his lecture, Professor Abel remarked that he had endeavored to show the immense amount which had been accomplished in regard to the development of explosive agents during the past few years. Unfortunately, associated with their value was the facility with which they could be used for illegitimate purposes and the comparatively slight knowledge which was required by persons who wished to use explosives in a mischievous direction.—*London Times.*

UNDERGROUND WIRES DISCUSSED.

A meeting of representatives of electrical companies was held last week in the Boreel Building, this city, in response to a call from the Gramme, American, Brush, Edison, Fuller, Jablochkoff, United States and Western electrical lighting companies. The object was to be an examination into devices for underground wires for electric purposes, with a view to a union of all the companies in a single system. Eleven telegraph companies—including the fire-alarm and police telegraphs, four district messenger companies—including the burglar alarm, a telephone company and five electric lighting and power companies are employing wires in this city. Several of these companies possess underground rights, of which a few have taken advantage. The Edison Company has a complete system in operation, extending under sixteen miles of streets. The twenty-one companies, having substantially the same requirements, could not lay independent systems because of the immense absorption of capital and the disturbance of the streets. The corporations, it was said, are as anxious as the public to have the problem solved. The ideal system is one under which every house may be supplied, on demand, with burglar-alarm, messenger-call, telephone, incandescent electric light, arc light, time wire, stock register, lifting and pumping power or telegraph connection, without delay, undue cost, removal of the pavement or disturbance of the streets. Of the 850 devices already patented, none furnish a solution of the problem. Representatives from each of the twenty-one companies and from several Eastern scientific schools were invited.

Among those present were Col. R. R. Hazard of the Gramme Company, G. W. Hebard of the United States, Clarence Cary of the Western Union, H. W. Pope of the Manhattan District, Major Eaton of the Edison, A. B. Chandler of the Fuller, Mr. Shaw of the Law, J. P. Davis of the Metropolitan Telephone and Telegraph, E. Holmes, W. E. Athearn, H. C. Roome, Prof. Henry Morton of the Stevens Institute, T. J. Montgomery, Elliott Smith, C. A. Cheever of the Jablochkoff, Mr. Bailey, S. J. Gordon, S. L. Parish, C. W. Price, Mr. Frick, and W. C. Behrens of the Gramme Company. Mr. Davis acted as Chairman, and Mr. Behrens as Secretary. Remarks were made by Messrs. Davis, Pope, Chandler and Shaw, and resolutions were adopted declaring that the time has arrived for making an exhaustive examination of all devices for underground electrical communication.

Following are the resolutions as adopted:

Resolved, That in the opinion of this meeting, the time has arrived when it is expedient to make exhaustive examination of all devices and inventions pertaining to the subject of underground electrical communication, with a view to determine whether any inclusive system can be found which will enable the electrical corporations to establish such communications.

Resolved, That it is the sense of this meeting that the public desire to relieve the thoroughfares from poles and wires is quite in accord with the wishes of the corporations, and that the true interest of the shareholder is to be found in a permanent inclusive and protected system.

Resolved, That the problem presented to the corporations and the electrical engineers is complex and difficult, and in the opinion of this meeting has not yet been fully solved; that any system to be adopted must combine the highest efficiency, reasonable economy, and serve inclusive interests; that while it is perhaps possible for trunk line telegraphs to avail themselves of existing devices, it is not possible in the present state of the art for services connecting every house in the city so to do without an expenditure so vast as to be prohibitory in most instances, and that, therefore, hasty compulsory legislation is to be deprecated as being destructive to useful and indispensable public conveniences.

Resolved, That a committe be appointed by the chairman of this meeting, either now or hereafter, at his option, consisting of one delegate from each electrical corporation invited to be present at this meeting, the Governor of the State, and Mayor of the city, with power to add to its numbers, which committee shall be authorized to examine the subject in respect to its scientific, mechanical, legal and financial considerations, with power to adopt such course of procedure as may appear advisable to it after such examination, and with the approval of the respective corporations to form a company in the collective interest, and consider such inventions and devices in that behalf as may prove to be indispensable to a successful installation.

THE PRUSSIAN BASE MEASURED AT GOTTINGEN IN AUGUST, 1880.*

This base was measured by First Lieutenant Schrieber (in company with the author) by Bessel's apparatus, which consists of four compound bars of iron and zinc inclosed in wooden cases. These cases had double walls, their inner space being filled with water for the purpose of checking the temperature of the bars during use; they were covered with white sheeting as a protection against the sun. The intervals between the bars, as also the distance between their free extremities, was measured by glass wedges, but a microscopic reading of the contacts was also occasionally made.

The base-line was 5,192.8 meters (5,676.79 yards) long, with a tolerably level section for two-thirds of its length, but with a rise of 101⅓ ft. for the remaining (southern) portion. It was laid out in 33 sections by 32 intermediate fixed points, of which Nos. 11 and 22 were marked with equal care as the ends of the base itself. This large number of "fixed" points is the distinguishing feature of this base measurement, and insured to it very great accuracy. Each bar was laid in position by a theodolite, the end of the bar being fitted with a specially designed sliding-sight for intersection by the cross-hairs. The ends of the base, as well as all its intermediate points, were twice plumbed up by two theodolites placed on either side of the point. When any part *N* of, say No. 4 bar, was vertically above a fixed point, a specially divided bar was substituted for the ordinary one, after the latter had been laid, and while bars III. and I. were still in position, and the fixed point plumbed up to *N* by two theodolites, each about 13 ft. from it. The author recommends not to find *N* directly, but by calculation after first approximating to it. It should be mentioned that special lenses are prefixed to the object-glass during this operation, to avoid difficulties in focussing at such short distances, care being taken that the collimation axis of the telescopes is not thereby disturbed. The point where work was stopped at night or at midday was found by suspending a thread over the end of the bar, and plumbing it downward by the theodolite observation upon a peg in the ground.

The 34 plumbings in the base measurement are lineally correct to $\frac{1}{8}$ millimeter; besides, any error therefrom is not carried forward in the work.

This base was measured—after three days' practice—the first time in three whole and two half days, and the second in two and a half days. The greatest measurement in one day was 2,013.6 meters (2,232 yards), a rate never attained before. On smooth ground all the four bars were laid in four and a half minutes, or, taking all the little pauses into account, in five minutes. By this rapidity all the little unavoidable changes through temperature, shaking, etc., were much reduced.

Exhaustive experiments showed that the wedges were read by eye to within $+\frac{1}{250}$ milimeter, and by the microscope $\frac{1}{1250}$ millemeter. Two successive bar intervals were always read simultaneously. In Bessel's apparatus the temperature of the bars is not directly observed, although the relation between the difference of expansion *k* of the zinc and iron rod, and the thermometric reading *R* is expressed by the equation.

$$R = 46.712° - 21.983\,k,$$

where *k* is measured in Paris lines. The author, however, by comparing the readings of the thermometers in the wooden cases with the temperature of the bars as calculated by the above equation, found that the latter was more correct when

$$R = 51.60° - 21.983\,k.$$

He also found that the differences between the observed and calculated values were always small, and attributes this fact to the cases being protected against solar radiation. The difference in temperature between the iron and the zinc parts of the bar is hardly 1°.

The paper concludes by very detailed calculations to show that the main error imposed on the long diagonal in the base triangulation (a line eleven times longer than the base itself) only amounts to $+ 2\frac{1}{2}$ millionths of its length, or about 5⅛ inches.—*Abstracts London Inst. of Civil Engineers.*

* Dr. W. J. Jordan: Zeitschrift fur Vermessungswesen, vol. x., p. 377.

PRINTING BY THE BLUE PROCESS.

The author describes an ingenious apparatus of his own contrivance for obtaining prints which shall be free from the defects produced by the printing-frames in common use. In the latter the pressure required to keep the paper in contact with the glass is applied at the periphery of the glass and of the back-board. This causes the center of the glass to spring, and the contact of the paper and the negative being consequently imperfect, only an imperfect print can be obtained.

The ordinary printing-frame used in photography is an excellent one for small negatives, when the back-board is well cushioned with cotton-flannel or woollen blanket, but in large sizes the plate glass is expensive, hard to handle, and liable to be broken by any uneven pressure. The improvement described is simply the adaptation of an air-cushion in place of a solid pad to insure the perfect contact of the sensitive paper with the negative. The back-board is in one piece, being clamped to the frame that holds the glass, and is covered by a piece of manila paper coated with shellac varnish. Over this a sheet of the thinnest rubber is laid, and then a single thickness of cotton cloth, the whole being secured at the edges by strap-iron, fastened by bolts to the wooden frame.

The air-cushion is charged by blowing from the lungs. A rubber tube, provided with a glass mouthpiece, leads to a T, one end of which is connected with a nipple introduced through the back-board and the other end of which is connected by a rubber tube with a pressure gauge.

Prints made in this apparatus are entirely free from blue lines, or any blotches or blemishes due to imperfect contact between the negative and the paper. An important addition to the apparatus is that by which it is so adjusted as to have the surface of the glass always at right angles to the direction of the sun's rays. This is secured by providing two adjustments, one by which the glass is rotated in a direction opposite to that of the rotation of the earth, and another in which a secondary axis is mounted on the primary one and at right angles to it, so that it can be rotated to the required position when the sun is either north or south of the equatorial plane.

In addition to this the author gives some notes of experiments on the sensitizing liquid, and the proportions for one yielding the best results. When the process was first introduced into this country from France the formula in use was as follows:

Red prussiate of potash, 8 parts; citrate of iron and ammonia, 8 parts; gum arabic, 1 part; water, 80 parts.

Beginning with the proportions—Red prussiate of potash, 10 parts; citrate of iron and ammonia, 1 part; water, 50 parts—different solutions were made, up to the proportions: Red prussiate of potash, 1 part; citrate of iron and ammonia, 10 parts; water, 50 parts.

The plan followed was to coat a sheet with a given solution, and after cutting it into strips to expose them all to direct sunlight and withdraw

* Abstract of a paper by Channing Whittaker, read before the Boston Society of Civil Engineers: Journal of the Association of Engineering Societies, August, 1882.

them one after another at stated intervals, thus giving a different time of exposure to each one.

The conclusions drawn from these experiments were that each mixture would give a deep blue after such exposure, that this would turn to a gray if over-exposed, but that two or three minutes' deviation from the proper time of exposure does not materially alter the result. The best formula, he finds, would be: Red prussiate of potash, 2 parts; citrate of iron and ammonia, 3 parts; water, 20 parts.

An excess of the prussiate lengthens the time of exposure, while that of the citrate shortens it.

We give below a formula which Dr. L. H. Laudy of the School of Mines has prepared and long used with excellent results:

Solution No. 1.—35 grammes (or 539 grains) of ferricyanide of potassium dissolved in 230 cubic centimetres (or 8 ounces) of distilled water.

Solution No. 2.—53 grammes (or 816 grains) of citrate of iron and ammonia dissolved in 230 cubic centimetres (or 8 ounces) of distilled water. These solutions must be kept separate.

When ready to prepare the paper, mix equal parts of Nos. 1 and 2 and apply to the paper either with sponge or soft cloth, and hang up to dry. These operations must be conducted in a dark room.

As soon as the paper is dry, place under negative or tracing, and expose to direct sunlight. After printing, place in water and wash thoroughly.—*C. F. McK. in School of Mines Quarterly.*

YE OLDE TIME SURVEYOR.

NOTE.—In examining a title at Dedham to-day, I came across the inclosed curious and interesting *poem*, which will probably prove entertaining to your readers.

I have copied the original orthography, capitals and punctuation, but the word omitted in second line of fifth verse has entirely disappeared from sight.

I presume the author was the surveyor, James Blake, Jr., ancestor of the Blakes who formerly owned South Boston Point. He made a survey of all the land beginning at South Boston and ending at Stoughton, occupying a little more than thirteen years in the work. M. McD.

The following lines are written upon an original "Map or plot of twenty-five divisions of land * * late in the township of Dorchester, now in Stoughton," made by James Blake, Jr., surveyor. "Finished May 8, 1730." The plan is on file in Norfolk County Registry of Deeds:

Upon our Needle we depend,
In ye thick woods our course to know,
Then after it ye chain extend,
For we must gain our distance so.

Over ye Hills through brushey Plains,
And hidious Swamps where is no track,
Cross Rivers, Brooks, we with much pains
Are forc'd to travil forth and back.

Briars & Thorns our Flesh Doth tear,
And Stubborn Brush our Garments rend,
Our Instruments need much repair,
Labour and Toil our Spirits spend.

Sometimes with heat we are oppressed;
Then Flys and Serpents they annoy us;
Sometimes for cold we have no rest;
And sudden heats & colds destroy us.

Our fare is mean, our suffering great,
Amidst all which our **** must keep,
And work come Right, our lines run strait,
All Plotted be before we sleep.

When weary Steps has brought us home,
And Needle, Chain have some respite,
Scale and Dividers in use come,
To fit all for next morning light.

And though we 're careful in ye same
As haft & obsticles will yield
Yet aftertimes they will us blame
When Rough wild woods are made a Field

Three of ye Gentlemen Improv'd
Do not survive ye work in hand
One quickly after was removed
Through mercy all ye Rest yet stand.

May we our Generation serve
According to God's holy will
And from his Precepts never swerve;
Labour to do our Duty still:

And all be ready for our Death;
That whensoe'er our change may be,
We may with Joy resign our Breath,
And from our Labours Rest may we.

May 8, 1730.

—*Boston Transcript April* 30, 1883.

THE PANAMA CANAL.

[From the "Bulletin du Canal Interoceanique," April 15.]

The report on the "progress of work," for the month of February is resumed as follows:

Colon.—The shed for protecting the freight discharged upon the new wharf is finished; this structure is 357½ ft. long.

Eleven houses have been added to the new village within this month; these houses are of two types, one with simply a ground floor and arranged for two families; the other with a second story and intended for four families. The locomotive round-house is finished.

Forty-three thousand four hundred cubic yards of material has been transported from the works at Monkey Hill to the terre-plain at Colon. About 1,500 cub. yds. of stone have been taken from the quarry at Kenny's Bluff to rip-rap the mole, the least block 1½ cub. yds. in volume.

The total effective force employed on the Colon section, that is those working in the excavation at Monkey Hill and employed in dredging, is 1,314.

Dredging in Folk's River.—There are two bucket and two "clam-shell" dredges at work here; they raised 47,220 cu. yds. in the month of February. They would have exceeded this had they not met a ledge of coral, which required the use of dynamite.

Monkey Hill.—5,300 cu. yds. more material was removed here than in January. Two excavators are at work.

Buhio-Soldado.—A new section of work has been started here, near the 24th "kilometer" of the canal line. A house has been bought, and three boarding shanties for the workmen are in course of erection.

An inclined plane is being constructed on the right bank of the Chagres, leading from the railroad to the canal; 43 workmen are employed here.

Gosgona.—Work is going on between Stas. 41.6 and 41.9, also between Stas. 43 and 44, at a place called Bas-Matachin. Opposite Sta. 43.7 a gallery about 100 ft. long has been started to investigate an outcropping of coal revealed in the boring.

Obispo.—378 laborers were at work on this section at the end of the month; 20,000 cu. yds. of earth has been removed.

Emperador.—543 men at work, 25,000 cu. yds. of material excavated.

Culebra.—A water-works has been constructed opposite Sta. 97.5, with brick reservoirs and two steam pumps. The supply is equivalent to about 8,500 gallons in 24 hours.

In the shops of this section, two American locomotives, and two American excavators have been put together, during the month, also 25 cars of 5½ cu. yds. each; 347 men were at work at the close of the month.

Paraiso.—The preparatory work is going on steadily, more than 60 shanties for colored workmen have been put up; workshops and an engine house are in progress; 30 cars and an excavator have arrived on this section. The number of workmen employed is 106.

THE dredge built on the Clyde (Eng.) and lately tested, was expected to start for Colon on April 10.

TUNNELING OF MOUNT BLANC AND THE GREAT ST. BERNARD.

[Translated from the Moniteur Industriel.]

The Italian press, and especially the journals of Turin, discuss almost daily the question of piercing the Alps. The *Gazette Piemontaise*, of the city just named, has very recently published a long article upon this subject from the pen of the engineer, M. Borelli, who, among Italians, is one of the most ardent defenders of the Mt. Blanc project.

Taking advantage of his presence in Turin, another civil engineer, M. de Vautheleret, on March 7, published an important letter exposing some of the errors into which M. Borelli falls in comparing the two routes, by Mt. Blanc and the Great St. Bernard. We believe it will be interesting to reproduce the following extract from the letter of M. de Vautheleret, as demonstrating in an irrefutable manner the advantages of the Great St. Bernard line.

"I will confine myself," says M. de V., "in replying to M. Borelli, to the main points only. M. Borelli observes that the Great St. Bernard line would be only one and quarter miles shorter than by way of Mt. Blanc. I must correct his figures; the saving in distance would be about fifty miles in favor of the Great St. Bernard.

"Actually the Mt. Blanc route, from Calais to Brindisi, passing through Dijon, Mâcon, Culoz, Mt. Blanc, Aoste, etc., is 1,365½ miles. The Great St. Bernard line, from Calais to Brindisi, passing through Dijon, Pontarlier, Martigny, Great St. Bernard, Aoste, etc., is about 1,315½ miles; hence the difference of 50 miles in favor of the route by way of the Great St. Bernard.

"M. Borelli furthers observes that the distance gained is neutralized by the difference in level which would exist between the two tunnels, and he cites in support of his side an elevation of 5,917 ft. for the Great St. Bernard tunnel. I must again correct his want of exactness in figures; for in my publications of 1873, 1879, 1880 the most elevated point on the proposed line is only 5,218 feet above the sea. It is not astonishing that at a level of 5,917 ft. the snow has been enabled to attain a thickness of 40 ft., as in 1830. It is expected that a man will exaggerate a little for the good of his cause, but truly the difference between 5,917 and 5,218 ft. is too great.

"I should note here that this last elevation is not yet certainly adopted in the final survey of the Great St. Bernard line. Upon further study it may seem better perhaps to prolong the tunnel about one and a quarter miles, and thus reduce the elevation about 853 ft. However, I do not wish to prejudge the question, and maintain the figures which I gave previously, that is to say, an altitude of 5,218 ft. for a tunnel 21,720 ft. long.

"Concerning the question of the expenditure for traction, I am convinced that the line which I propose will realize an economy of $20,000,000 over the Mt. Blanc route. I am convinced that the working of this line, even at a cost relatively dearer, will never demand an expenditure equivalent to the interest of the sum that must be expended in the construction of the Mt. Blanc route. I fix the figure of $20,000,000 upon the data given by the French Parliamentary Commission of 1879, and to which M. Borelli refers.

"The formulated conclusions of this Commission were that an expenditure of $35,800,000 was indispensable to construct the Mt. Blanc line and that the tunnel, which should not be less than 11.87 miles long, would cost $15,200,000.

"My project, with an elevation of 5,218 ft. and grades not exceeding 30 per cent., would, on the contrary, only cost $10,000,000, with a tunnel 21,720 ft. long; and supposing a tunnel even 29,520 ft. long, which would be demanded by the reduction in altitude, and a corresponding increase in cost to $16,000,000, there would still remain a saving of $20,000,000 over the Mt. Blanc scheme. I should also remark that the work at the Great St. Bernard could be finished in *five years*, while the Mt. Blanc tunnel would increase the time to at least ten years.

"Finally, I hardly need refer to the very grave difficulty which presents itself in penetrating under Mt. Blanc, and that is the very high temperature to which the workmen will find themselves exposed at certain points in the tunnel.

"After what I have said, there is no further need of demonstrating the great advantages, from any point of view, which the Great St. Bernard route presents over its ancient rival, Mt. Blanc. I will only repeat, once again, that the question is urgent, and we should make every effort to solve it as promptly as possible."

CORRESPONDENCE.

A NEW PUZZLE.

PITTSBURGH, Pa., April 26, 1883.

EDITOR ENGINEERING NEWS:

MY DEAR SIR: On page 192 of your issue of April 21, 1883, is an article entitled "A New Puzzle," at the end of which is this question, "What becomes of the inch?" The answer is very simple. The inch disappears in inaccurate statement and in imperfect work.

Dividing up the 5 in. × 13 in. rectangle as instructed, we have two right-angled triangles, of 8 in. base and $3\frac{1}{13}$ in. height, and two trapezoids of 5 in. height and bases of 5 in. and $3\frac{1}{13}$ in. The hypothenuses of the two triangles are placed against each other so as to form a rectangle of 8 in. × $3\frac{1}{13}$ in. The two trapezoids are matched in like manner along the inclined faces, giving a second rectangle $8\frac{1}{13} \times 5$ inches. These two rectangles when juxtaposed along the long sides, give very nearly a square; in fact it contains two rectangles, one 8 in. × $\frac{1}{13}$ in., the other 5 in. × $\frac{1}{13}$ in., more than a square of 8 in. on a side, and these two rectangles together contain just one square inch. Consequently we see that the "exact square" of the article is decidedly inexact. Yours truly,

T. A. MAHAN, Capt. Engineers.

OPENINGS FOR INVESTMENTS OF CAPITAL IN MEXICO.

EDITOR ENGINEERING NEWS:

PAWTUCKET, R. I., April 30, 1883.

A portion of your readers may be interested in the question of openings for the profitable investment of capital in public works in Mexico. Unfortunately the general public in the United States are ignorant of Mexican resources and needs, and, unless they awaken to the grand possibilities offered in that country, our English cousins, or the Mexicans themselves, will forestall them in securing the benefits now only waiting to be reaped. The English Consul-General from Havana has lately visited Mexico for the purpose of making overtures to the government toward the renewal of diplomatic relations between the two countries, which were suspended years ago. This movement tends to show that the English appreciate the advantages to be derived from friendly official intercourse between the two governments. So far the foreign capital invested in Mexico in public works is confined to railroads. The success of the main line of the Mexican Central Road, which, although only partly finished, is *paying to-day its coupon interest on its outstanding bonds as well as having a handsome surplus*, is a proof of the sagacity of the New England capitalists who control the scheme, and reflects also credit on the local management of the company in Mexico. The English are now fully awake to the important field still left open in the railway line, and have invested largely in the Palmer-Sullivan or National Road, which, it is now rumored, they are to obtain entire control of. A concession has also been recently granted an English company for a railway from Yuspar, on the Gulf of Mexico, to the City of Mexico, so that American capital invested in railways bids fair to be exceeded in amount by our English friends. But the surest investment for capital in that country seems to have escaped the observation of foreigners. I refer to works of *Water Supply*. During some two years professional residence in the republic I have made careful and continuous observation as to the needs of water-works and sewerage systems of several cities, and gathered statistics, so far as able, as to revenues to be derived from investments in works, and am thoroughly convinced their construction would prove an investment which would return far greater per cent. of profit than any railway in existence. There are numerous cities of from 15,000 to 100,000 inhabitants, with *no public supply*, all the drinking water being brought into town on jackasses' backs, and sold *by measure*. In two cities where I weighed the water I found the price paid upward of $2.50 per thousand gallons, while the average meter rates for water in the United States may be taken at 25 cts. per thousand gallons, in Pawtucket it being sold in large quantities as low as 8 cents. The question would naturally suggest itself that works in Mexico would *cost* much more than in the United States. A factor, however, which causes our works to cost so much, is the necessity of provision for an effective *fire service*. This factor is eliminated in the Mexican works, as the cities are practically *fire-proof*, any fire being so confined as to be easily controlled without danger of a serious conflagration. While the cost of pipe per *ton* would be greater in Mexico than in the United States, the cost per *foot*, domestic consumption only being provided for, will be *less*, on account of the much smaller pipes required. Some skeptics may be alarmed at the idea of investing capital in a foreign country, especially in Mexico, which is too generally considered a land of revolutions and lawlessness. Allow me to state from *personal observation* that the idea is born of ignorance. The fashion of wearing fire-arms openly has caused many a visitor who has spent a few days in Mexico to come home with harrowing tales of insecurity of life, the narrator probably having confined his sojourn to a few days in the capital of the republic. I have ridden through the country at all hours, and have never been molested. No American employed by the Central Railway, now running north from the City of Mexico some 325 miles, has ever been attacked or threatened by the natives. Toward the *frontier* the Indians have killed people on both sides of the boundary, but in justice to Mexico it must be said the interior of the country is much safer than in Texas, toward the frontier, or in our newly settled mining towns in the West. I am led to make this statement from opinions gleaned in conversation with people who have visited both sections. So far as *revolutions* are concerned, they may be considered as things of the past wherever the railways are opened to traffic. The troops can now be massed so rapidly as to quell any attempted outbreak in its incipiency, and the government is firm and prompt in its action. Capital invested in public works in Mexico is protected by what are termed "*concessions*," similar in character to our charters. To-day concessions can be secured for about any work of public improvement, such as railways, horse railways, water-works, etc. These concessions, so far as granted, are very liberal in their provisions, admitting all materials used in the construction of the various railways *free of duty*. This enables the Central road to receive rails from Europe at about the same cost as in the market here. Water pipes used in the republic, for public supplies, as well as fixtures connected with the plant, would undoubtedly be put on the free list. Sewerage of various cities must shortly be considered, as many places now having large death rates could be made healthy if properly sewered. The city of Guanajuato is a striking example. Naturally one of the healthiest locations in the interior, the absence of any provision for drainage renders it very unhealthy. The sewage of the city is deposited mainly in the Guanajuato River, which during six months of the year is *dry*. As a natural consequence, zymotic diseases result to a fearful extent. With a proper sewerage system the saving of human life would be immense. The Mexican people, as a class, feel friendly toward the United States, and welcome the investment of capital. Shall our capitalists lie dormant until others reap the benefits of the brilliant openings now offered for the construction of water-works, or by prompt action secure the prizes? If this article should chance to meet the eye of any person desirous to investigate the subject fully, I should be pleased to give such further information, by letter, as may be in my power.

C. H. M. BLAKE,
Civil and Sanitary Engineer.

FOUNDING PIERS IN THE ATCHAFALAYA OF LOUISIANA.

The accompanying plans illustrate the methods adopted in sinking the iron cylindrical piers for the bridge now being erected for the Texas & New Orleans R. R., over the Atchafalaya River, near its junction with the Red River, in Louisiana.

This bridge being located in the lowland region of the State, where the soil is alluvial and of a depth almost limitless, subject to rapid and extensive scouring action, deep foundations were absolutely necessary for safety. No suitable stone was to be found within any reasonable distance, and, unless used in connection with an expensive caisson, was not adapted to the site; hence iron cylinders were adopted for the piers and abutments.

It was the original intention to use compressed air in sinking these cylinders, it being expected that a safe foundation could be obtained at a distance of 90 ft. below the ordinary water surface; but later investigation into the rate of scour proved that a depth of 125 ft. would be required; which, being beyond the "limit of safety" of previous pneumatic experience, made this method unadvisable.

Compressed air being abandoned, a modification of the Milroy Excavator was suggested by Mr. John F. Andersen, the superintendent of the company, and finally put into practice with the success shown.

The cross-sections of the Atchafalaya River at and near the bridge are by no means the least interesting of the accompanying diagrams, especially when taken in connection with the possibility of the Mississippi River finding its way to the Gulf at some future time by this route. This very imminent possibility is the problem that is now set before the Mississippi River Commission, and the diagrams would seem to prove that some speedy action in the matter was necessary.

At the bridge site, the general cross-section shows first a layer of driftwood, 10 ft. in depth, troublesome to penetrate, then about 30 ft. of hard blue clay, then sand and clay mixed for 10 ft. more, and finally sand to an unknown depth.

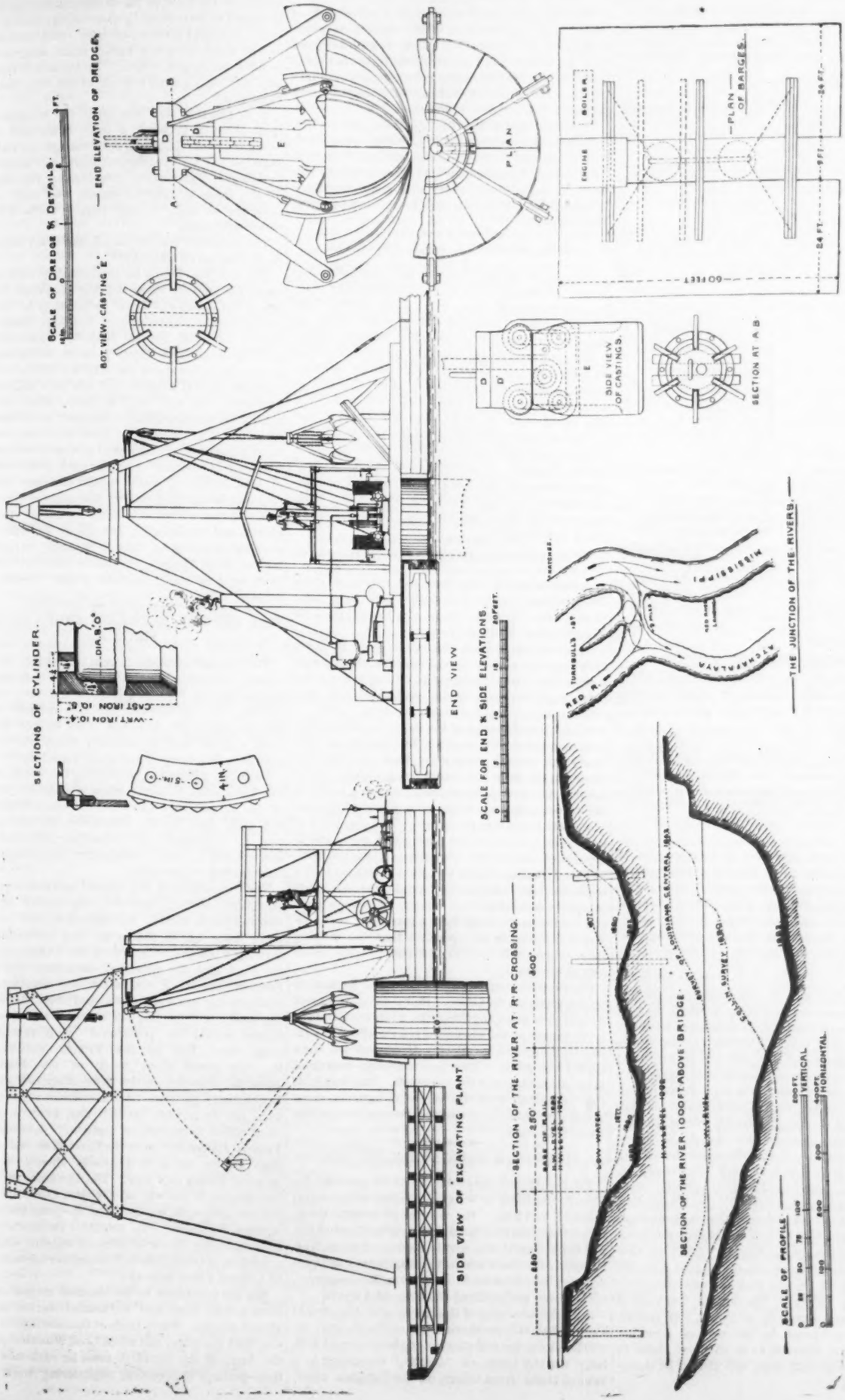
The cylinders used were 8 ft. in outside diameter; below the level of the river bed they were made of cast iron 1¼ in. thick, in lengths of 10 ft. 4 in., the sections secured together by inside flanges, and bolted by 1 in. bolts spaced 5 in. apart. Above the river bottom the cylinders were made of wrought iron riveted, ⅜ in. thick, with angle-iron flanges, bolts and spacing same as above.

The "plant" for handling the cylinders and the excavator is fully shown on the plan. It was erected upon two wooden barges, each 60x24 ft., secured together at one end so as to leave a space of 9 ft. between them; the engine was 50 H. P.

As remarked before, the excavating apparatus is a modification of the Milroy Excavator, used in England and India, but more compact and simple in its action than its English prototype. The capacity of the full bucket is two-thirds of a cubic yard. Its general appearance is illustrated by the plans shown. Describing its working from an inspection of the drawings merely, as we understand them, it is as follows: The excavator is provided with two chains, one secured to the eye-bolt in top of the casting *D*, the other passing through *D* and around a series of rollers or shears, as shown on "Side View of Castings," is fastened to the lower casting *E*. The hoisting engine has two drums, by which these chains can be manipulated independently. The six arms carrying the bucket-sections are secured by pins to the lower casting *E*, and are so connected to the upper casting *D* by the forked levers, that by raising the top casting by its appropriate chain, the bottom one remaining stationary meanwhile, the arms will be thrown out and the bucket opened; bringing the two castings together by lifting the lower one, will, on the other hand, close the bucket and allow its contents to be hoisted. A double-sheaved boom-derrick lowers and hoists the bucket, and swings it to one side so that it may discharge its contents into a chute. Three men furnish all the necessary labor.

The bridge to be erected on these piers when finished will be 800 ft. long, made up of two 250 ft. spans, and draw-span 300 ft. long. Actual work was commenced Aug. 1, 1882. Two 8-ft. cylinders will form each permanent span pier. The arrangement of the pivot-pier is not given as yet.

Reverting to the cross-sections illustrated, that one taken 1,000 ft. above the bridge crossing, shows plainly the very marked changes that have taken place in the area of water-way between the dates named. The average increase in depth of channel is 80 ft. in 20 years; and in one portion 50 ft. has been gained in two years. Mr. Andersen gives as a potent reason for change in his plans an increase of 30 ft. in width and 8 ft. in depth as the work of one year's floods upon the river contour. As the river deepens, the banks are undermined and cave in. It is this action that causes the abrupt bench shown on the lower diagram, to the right, and the sloping of the same bank in the upper cross-section. The right-hand shore cylinders were pushed out of the perpendicular by this movement of the bank. For the original plans and the data upon which this sketch is based, we thankfully acknowledge our indebtedness to Mr. John F. Andersen, the present Superintendent of Bridges for the American Railway Improvement Co., of which Gen. G. M. Dodge is the President. Mr. Andersen was formerly Superintendent of the Hudson River Tunnel in this city, and has had much experience in this peculiar line of engineering.



FOUNDING PEIRS IN THE ATCHAFALAYA OF LOUISIANA.

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NOTICES OF MEETINGS.

A meeting of the Ohio Institute of Mining Engineers will be held at Youngstown, Ohio, on Wednesday, May 9, 1883, with headquarters at the Tod House.

The meeting is public, and all are invited. A full attendance of members is expected. Representatives of the leading Mining and Civil Engineering Journals will meet with us.

The exercises will consist in the reading of papers. Discussion of the following topics:

"Signals in Mines," "Lighting of Mines," "Fees and Salaries," "Mining Machinery," "Old and New Methods of Working Coal," "Mining Engineering and Surveying," "New Legislations," "New Litigation," "Surveying Instruments," "Oils," "Lamps," "How to Keep Survey Points," "Drill Holes," "What is Minable Coal." "Horsebacks," etc., etc.

Report of Committee on Constitution. Reports of Officers. Inspection of Mines near Youngstown.

A. ROY, President.

R. S. PAUL, Secretary.

AMERICAN INSTITUTE OF MINING ENGINEERS,
SECRETARY'S OFFICE

The next meeting of the Institute will be held at Roanoke, Virginia, during the first week in June. A detailed programme of sessions and excursions will be issued early next month. Members are requested to send to the Secretary as soon as possible, the titles of the papers they intend to present at this meeting.

EASTON, Pa., April 2, 1883. T. M. DROWN, Secretary.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—The annual Convention of this year will be held at St. Paul and Minneapolis, Minn., beginning June 19, 1883. Full arrangements will soon be announced.

It is also proposed to make special provision for a visit to the Exposition of Railway Appliances, at Chicago, before proceeding to St. Paul and Minneapolis.

JOHN BOGART, Secretary.

APRIL 5, 1883.

AT the New York Academy of Sciences, No. 12 West Thirty-first street, on Monday evening, April 30, the following papers were read: On the Decay of Building-Stones, Part II., with illustrations from the old cemeteries of New Utrecht, Flatbush, etc., by Dr. Alexis A. Julien; On the Disintegrated Sandstone at New Durham, N. J., by Mr. Nelso H. Darton.

MAY-DAY.—We expect numerous complaints of various kinds and intensity to reach us next week. This week has been an unusually hard one for us, and it will take all of the coming one to bring up our business. We only got possession of our new offices on Tuesday, and since then have hardly had a place to sit down in. Painters, kalsominers, carpenters and cleaners have had full possession, and newspapers, books and stationary have been quite inaccessible. As we write—on Thursday afternoon—chaos still reigns, but out of it all we perceive a couple of very handsomely appointed offices, facing the lovely foreground of the City Hall buildings and Park, the Post-Office, Broadway and the other interesting surroundings which are overlooked by this structure—the finest newspaper building in the world. Amid our new and elegant appointments we hope to be honored by the calls of our friends and patrons whenever they are in this vicinity. Our friends from out of town are always especially welcome, and any assistance we can furnish in the way of directing them to points of interest, so as to allow them to make the most of their time, will always be cheerfully rendered.

THE AQUEDUCT BILLS.

We have abstained from any comments upon the merits and demerits of the several aqueduct bills now before the New York Legislature, and for the reason that as yet the agitation is purely political, a struggle among party cliques to obtain the control of the expenditure of a large amount of public funds, some $20,000,000.

Whether the Croton or the Ramapo is the best source from a commercial or an engineering standpoint, has not yet been made sufficiently clear to be discussed by outsiders. As soon as the debate takes a professional form, and is removed from the realm of politics, we shall be only too happy to enter into it.

THE INGERSOLL ROCK DRILL CO.

We are in receipt of a new and tastefully illustrated catalogue of the above company, announcing their removal from No. 1 Park place, which office they have occupied for so many years, to more roomy quarters at No. 10 of the same street.

We congratulate the company upon the increase in their business which has made this change necessary, and for the opportunity the space now at their command gives them for exhibiting properly the many parts of their rock drilling plant, and all the necessaries belonging to the business.

Their catalogue, a little book of 90 pages, is really elegantly illustrated, and contains very much that is of interest to those engaged in mining, quarrying, or contract rock work of any kind. It is sent free upon application. Their manufactory is not changed.

A NEW SNOW EXCAVATOR FOR RAILROADS.

A new form of excavator for removing snow from railroad tracks was tested last week near Orangeville, Ontario. It is the invention of De Witt Hawley, of Rochester.

This machine is built entirely of steel, is thirty feet long, and cuts an eleven-foot channel through a snowbank 12 feet deep at the rate of seven miles per hour. The plate frame is divided into two compartments, the forward one being open at front for the admission of the snow; in this forward section stands a vertical screw conveyor or elevator, made of riveted plates; the floor is depressed nearly to the rails, the latter being cleared by an apron. The rear compartment contains a boiler of 100 horse-power, which supplies power to two engines which operate the screw. The excavator is pushed by a locomotive. The screw conveyor is capable of making 300 revolutions a minute with 60 lbs. of steam. When the plow is pushed into a bank the snow is naturally forced into the front compartment, where it is caught by the conveyor and hurled to the roof; here a revolving steel deflector is placed in such position that the rushing snow may be delivered 30 or 40 feet away on either side of the track.

On the trial mentioned, the snow was banked up on the track six feet deep. Being damp, the great weight prevented anything like a fair trial; but the performance of the excavator fully realized the expectations of the inventor. It opened the bank slowly but surely. The railroad men expressed themselves pleased with the result. The weight of the excavator with its screw is eighteen tons. Sixteen of them are already ordered for various roads in Canada.

THE NORTH AFRICAN INLAND SEA,

Ferdinand de Lesseps on April 16 gave to the French Academy of Sciences a report of his recent missions to Africa. He went to personally investigate Commandant Roudaire's proposed inland sea, and has returned thoroughly convinced of its feasibility, and of the wisdom of promptly creating a sea destined marvelously to transform the economic, agricultural and political condition of Algeria.

A glance at a map of that section of the world shows that the southern part of Tunis and the southeastern part of Algeria are interspersed with large marshy lakes, or "Chotts," extending in a kind of chain from Gabes, on the Tunisian coast, almost to Biskra, 300 miles inland. These lakes are below the level of the Mediterranean, and it is proposed to flood them by excavating a connecting canal, and thus form a vast lake containing some two or three thousand square miles, deep enough to float the largest vessels. No rocks will exist in this lake, only a mud bottom of not less than 60 ft. in depth.

It is claimed that the canal will be situate almost entirely in sand, a little calcareous rock being found on the route, only enough to furnish material for the breakwater, piers and necessary buildings. The country surrounding the lake is of the same alluvial formation, and only needs moisture to make it very fertile; wells of fresh water now exist.

The estimated cost of the scheme is set down by M. de Lesseps at $30,000,000.

The London *Times*, in commenting editorially upon this project, warns the English people not to repeat the blunder of Lord Palmerston in underestimating the possibilities of the Suez Canal, and setting down its French projector as an unpractical dreamer. The *Times* goes on to say that de Lesseps has gone about this African business in a cautious, careful manner, and has been assisted by engineers who are likely to know what can and cannot be accomplished. Stripped of all the exaggerations of rumor, the plan does not seem to be so gigantic or so chimerical as was once thought. The fears of a certain class that such a translation of vast bodies of water would produce radical physical changes in Southern Europe prove groundless, and the enterprise is simply work for the engineer and capitalist. The *Times* disclaims all political jealousy of France in such an undertaking, even though enormous territory would thus be practically brought under French dominion.

THE TUNNEL BETWEEN ENGLAND AND FRANCE.

The tunnel question is still a subject of discussion in England and France, not only among engineers, but among capitalists, and also, unfortunately, among diplomatists and military men. The general public, however, looks on the matter with a good deal of common sense, albeit there may be a deficiency of technical knowledge.

Paul Leroy Beaulieu, in treating the question in the *Economiste Français*, gives a succinct history of the tunnel, and throws a curious side light at the same time on the difficulties thrown in the way by diplomacy, the retarding effects of red-tapeism and the slow recognition by politicians of enterprising engineering.

The true author of the tunnel project was the celebrated Michel Chevalier, the father of the Anglo-French treaty. He broached the subject eight years ago in the press, and succeeded in forming a company comprising the Chemin de Fer du Nord and the principal capitalists and engineers of France. A concession was obtained, preliminary surveys were made, and were it not for the coldness of the English toward the project the tunnel would be completed in a few years from now. But as the French writer puts it, "In every great work of the kind the principal obstacles are not those offered by nature. Legislation, politics, administration, prejudice—these are the terrible barriers that every inventor must either surmount or upturn." A celebrated French statesman once declared that not more than twelve miles of railroads should be constructed during any year. The diplomatic difficulties thrown in the way of the Suez Canal are well known, although we see that the principal opponents of the scheme—the English—are now seriously considering the advisibility of digging another, a meeting of capitalists to that end having been held in London a few days ago.

But the opposition to the channel tunnel comes from a very large and influential section of the British people. When Herbert Spencer agrees with Cardinal Manning, and when Lord Wolseley echoes the fears of the timid, it must be confessed that this—perhaps the greatest engineering work ever

contemplated—has to meet with serious difficulties altogether outside of its technical ones. Mr. Bright, in a speech which he recently made before the Society of Civil Engineers, pointed out very lucidly how steam, which was once to render it possible to invade England has been rather its safety—there has been no war between the two countries during the past fifty years. The Duke of Wellington, grim warrior though he was, discountenanced the London Exhibition of 1851, on account of the danger of having so many French soldiers coming over disguised as tourists. The very same ideas are cropping up again. Another objection is a very selfish one. With a railroad between France and England what is to become of the shipping business, not only between the two countries, but between England and all the European Coast line? The insular quality of England seems to be a very precious thing in the eyes of some Englishmen, for now that it is threatened they begin to appreciate it, like people about to lose friends who were not valued. The military party in England will have great weight in deciding the question; in Spain the military party have put in their *caveat* against boring the Pyrenees.

In the mean time the tunnel is emerging from the hazy regions of discussion into practical plans, and engineers are devising new and powerful excavators and special apparatus which may have an important bearing not only on the rapidity with which the tunnel can be made, but may even open before engineers and capitalists other potentialities and

"Fresh fields and pastures new."

We shall give a description of one of these machines in an early issue.

THE AMERICAN SOCIETY OF CIVIL ENGINEERS.

A business meeting was held on the evening of May 2, at the house of the society; about 35 members were present, President Paine presiding. The usual routine business was transacted, and the election of the following new members announced:

FOR MEMBERS:

GEORGE HENRY BEUZENBERG, City Engineer, Milwaukee, Wis.

JUDSON W. BISHOP, Civil Engineer, St. Paul, Minn.

FRANK LOOMIS GRISWOLD, Asst. Supt. Road Department, Mexican Central Railroad, Lagos, Mexico.

RANDELL HUNT, City Engineer, Fargo, Dakota.

FRANCIS W. KIMBALL, Asst. Chief Engineer Chicago, Milwaukee & St. Paul Railway, Milwaukee, Wis.

CHARLES JULIUS POETSCH (elected Junior May 14, 1881), Asst. City Engineer, Milwaukee, Wis.

ARTHUR HILLMAN SCOTT, Asst. City Engineer, Milwaukee, Wis.

DAVID C. SHEPARD, Civil Engineer, St. Paul, Minn.

JARED A. SMITH, Major of Engineers, U. S. A., Indianapolis, Ind.

GEORGE HOWARD WHITE, Engineer in Charge Division Office, Chicago, Milwaukee & St. Paul Railway, Minneapolis, Minn.

FOR JUNIOR:

GEORGE ANTHONY LEDERLE, Asst. Engineer Bismarck Bridge, Bismarck, Dakota.

Secretary Bogart announced to the members the death since last meeting of J. Milton Courtwright. June 19, was fixed upon as the opening day of the annual convention to be held at Minneapolis and St. Paul; a circular will be issued to members during the present week giving the full details of programme for the convention. The Secretary read a paper by J. A. L. Waddell, Prof. of Civil Engineering in the University of Tokio, Japan, upon "Methods of Designing Highway Bridges." The paper was lengthy, filled with references to "authorities," among which the "Carnegie Handbook" was prominent, and tables of detailed dimensions.

The paper was discussed by Messrs. Cooper and Macdonald. The objection was made to it, that, if intended for engineers, the paper was too voluminous and contained a mass of unnecessary detail; if intended for the non-professional it was not full enough. Mr. Macdonald remarked that what was really needed for the "improvement of highway bridges," which appeared to be the object of the author of the paper, was the education of County Commissioners up to the fact that first-class engineering supervision could save them money, and was essential to sound construction and public safety. Mr. Cooper pointed out the fact that the most binding specifications were valueless without an intelligent engineer behind them to see that the work specified and paid for was really obtained. He also called attention to "patchwork specifications," in which an engineer ambitious of making "his own," abstracts such paragraphs from standard specifications as suit him, and sometimes combines such extracts that one clause will nullify another, to the mystification of the engineer called upon to design a bridge from his data.

Among the visitors present were Gen. Comstock, and Senor de Garay, Civil Engineer, from Mexico. The latter gentleman, in an informal talk, gave to a number of the members present some most interesting information regarding the work of the old Spanish engineers in that section, and the system of drainage and irrigation canals now proposed for the improvement of Mexico. Senor de Garay made especial mention of the tunnel driven by the old Spanish "Cosmographer," Martinez, in 1608. The length was thirteen miles, diameter about twelve feet, and material principally "hard pan," with some volcanic tufa; the time of excavation was *eleven months*, an astounding rate of progress, obtained by a multiplicity of shafts, and at a cost of many lives among the Indian workmen. The tunnel having failed by reason of not being lined, an open cut 250 feet deep, was started by Martinez himself, and the work has practically been continued to the present day in the face of extreme difficulty from landslips, washing in of the soil, etc. Senor de Garay read a paper upon this subject some months ago before the society. Its publication is promised in the next number of the Transactions. We might mention incidentally that the author is the last representative of the Spanish Conqueror Cortez, and the inheritor of the Cortez estate. While laboring in a somewhat different field from that in which his ancestors achieved worldly fame, Senor de Garay has set out to solve a problem that will require the exercise of all the family characteristics of "push," combined with more intelligence and technical knowledge than the "Conqueror" ever dreamed of in his philosophy.

After adjournment, the members and visitors did full justice to the collation provided under the experienced direction and by the judicious "mixing" of the Secretary.

PERSONAL.

JAMES LEVINS has been elected chief engineer of Rutland, Vt.

Mr. JOSEPH E. WALTZ has been re-elected City Civil Engineer of Dayton, O.

JOHN THOMAS has been appointed General Superintendent of the Pittsburgh, Fort Wayne & Chicago R. R.

RUST & COOLIDGE, Engineers and Contractors, have removed their city office to First National Bank building, cor. Dearborn and Monroe Streets, Chicago.

MAJOR DAVID PORTER HEAP, of the Light-house Board, is in New York for the purpose of arranging the details of the construction of the proposed tower at Hell Gate.

E. T. SCOVILL, is Chief Engineer for the contractor, A. ONDERDONK, Canadian Pacific Railway. M. J. HARVEY, is General Superintendent. Headquarters are at Yale, British Columbia.

A special construction train on the Texas & Pacific Railroad ran into a steer on Sunday last and threw the two head cars from the track, killing T. A. SIMMONS, a civil engineer, and two other men.

In "News of the Week" of ENGINEERING NEWS, April 28, CARROLL E. GRAY, contractor for Water and Gas Works is wrongfully located at "Athens, Mo.;" it should be St. Louis, Mo. As Mr. GRAY is very widely known in contracting circles, the error is not a serious one.

At the last meeting of the Engineers' Club of Philadelphia, the Secretary, in speaking of engineering relics, referred to the existence of a leveling instrument that had belonged to Washington. A few days afterward he received from a member of the club the following inquiry: "Is the leveling instrument to which you referred on Saturday night and which belonged to Geo. Washington, Esq., a hatchet?"

HOWARD FRY, Superintendent of Motive Power of the New York, West Shore & Buffalo Railroad, was fatally injured in an accident which occurred on the Chicago & Grand Trunk Railroad near Bellevue, Mich., on last Friday morning, 27th ult. He had been through Canada to place his oldest boy at school, and was on his way to Chicago to see after the building of cars at the Pullman shops for the road with which he was connected.

REMOVAL NOTICE.—The Knowles Steam Pump Works beg to announce that they have changed the location of their salesroom from No. 86 Liberty street, New York, to No. 93 on same street—nearly opposite the old store.

Extensive alterations and improvements have been made in the new location, in order to accommodate their largely increased business, which requires more room and conveniences for exhibiting and handling heavy pumping machinery. They propose to keep in stock a more varied assortment of their improved steam pumps, air compressors, vacuum pumps, etc., than they have ever shown during their 15 years occupancy of Liberty street.

The manufacturing facilities have also been greatly enlarged during the last year, especially in building large water-works pumping engines.

THE Geo. F. Blake Manufacturing Company desire to call attention to their removal, which took place May 1, to their large and commodious new warerooms, Nos. 95 and 97 Liberty street, where they will carry a larger stock of steam pumps and pumping engines than ever before, with the intention of keeping on hand a full line of all their specialties, which, in their late contracted quarters, they have been unable to show.

At the Convocation of Queen's College, Kingston, Canada, held on the 24th ult., the title of LL. D. was conferred on Prof. ROBERT BELL, of the Geological Commission of Canada. We quote from the Toronto *Globe:*

"Before conferring the title of LL.D. upon Professor BELL, the Vice-Chancellor read this little sketch of his career. ROBERT BELL, said he, is assistant director of the Geological Survey of Canada, and one of the few native Canadians who have devoted their entire lives to scientific pursuits. He comes from a family the members of which have always been remarkable for the interest they have taken in the objects of natural science, and the valuable geological and mineralogical collection presented by his late father, formed the nucleus of the museum of this University. Dr. BELL graduated with distinction in McGill College, Montreal. While still a very young man, he was employed on the geological survey, and enjoyed for many years the teaching and example of the distinguished geologist, Sir WM. A. LOGAN, its first director. He is now the oldest member of its staff, having been appointed more than a quarter of a century ago. DR. BELL is a practical naturalist, geologist and geographer. A large proportion of what is definitely known of the geology of Canada and the topography of the more remote parts of the Dominion is due to his assiduous labors. His accounts of these investigations contained in the annual reports of the Geological Survey, and his numerous articles on Zoölogy, Botany, Geology and Mining, published in other forms, have added greatly to the credit of Canadian science. Dr. BELL is a Fellow of the Geological Society, London, and of the Royal Society of Canada, and a member of various other learned societies; but it has been deemed peculiarily fitting that he should receive from this university, in which he was formerly one of the professors, the honorary academical degree of Doctor of Laws."

Dr. BELL, in a few words, acknowledged the honor

As the new L.L.D. was a fellow class-mate of ours in civil engineering in McGill College, Montreal, we take the liberty to congratulate him on his new and well deserved honors.

THE NORFOLK SEWERAGE SYSTEM.

BY RICHARD LAMB, C. E.

Written for ENGINEERING NEWS.

Norfolk, Virginia, is situated on a low peninsula, nearly surrounded by the waters of the Elizabeth River. Its highest contour is but 12 ft. above mean low water.

Since the Colonial Assembly of Virginia, in 1682, purchased the site as a location "convenient for the encouragement of trade and manufacture," and, in fact, since King George II., in 1736, considered it "a healthful and pleasant place, commodious for trade and navigation," and therefore established it as a borough, it has nearly doubled in area; not by the usual slow geological process, but by the pushing energy of man. It is safe to say that nearly one-third of Norfolk is built upon reclaimed lands. Creeks made up into the very heart of the city, and in excavating for the sewers in some of the interior streets, wrecks of vessels and old Spanish and English coins have been exhumed from depths fifteen and more feet below the present surface, showing that the land on which the present city is built was, to a great extent, covered with wharves and docks to accommodate the West Indian traffic of those old colonial days.

Acre after acre of the land of this city is made entirely of oyster shells. This little mollusk contributes so extensively to geological growth that the owner of an inundated tract of land has only to build a wharf and establish one or two large oyster packing houses upon it, and in a few years he is in possession of acres of firm land.

So much of the soil of Norfolk being made land, it is of a necessity very porous, and being low, is in consequence very damp. Why the place has not been more unhealthy, no one can tell. However, the death-rate of Norfolk has been sufficiently large to impress upon her citizens the importance of having the city properly sewered and drained. There was—as usual—great diversity of opinion as to the best method for accomplishing these desired improvements, which resulted in their employing Col. Geo. E. Waring to plan a thoroughly efficient system. An accurate topographical map was ordered to be made, and soon after its completion Col. Waring made a tour of inspection of the place, and after considering several plans, decided upon the system substantially as is at present being constructed.

The city employed Major J. H. Humphries—engineer of the Memphis system of sewerage—as their chief engineer, and in February, 1882, the ground was first broken.

Probing revealed the fact that much fine sand and water would be met, so it was deemed advisable that on every line pipe laying should be begun at the highest elevations, and from there be laid down grade, in order that all sand and water might be kept from flowing into the pipes.

Six-inch terra cotta pipe was used on most of the laterals and every 50 ft. hand-holes were laid to facilitate the inspection of the pipe. The hand-holes used were of a design never before used on any system, so far as we are aware. They consist simply of a pipe having a rectangular segment taken from the side; a larger segment of pipe is made to fit over the hole thus formed, which acts as a movable cover. Some of these covers are provided with T branches to further facilitate inspection. It is not anticipated that it will be necessary to make use of them often, as at the terminus of each lateral is placed a Field's flush-tank, capable of discharging into the pipe 140 gallons of water in one minute. It would be well to mention the fact that the trouble heretofore experienced in using these flush-tanks, of the subsidiary siphon losing its charge, has been obviated by contracting the orifice of the lower limb. This was done by casting a conveniently shaped protuberance within the limb. The flush-tanks are supplied with water from the city water-works.

The pipes were laid at first by caulking with gasket and cementing. The cement selected was Copeland's Anchor brand hydraulic, which has given, so far as has been ascertained, most excellent results. During the latter part of the construction a process was used for joining pipe, which, so far as we know, has never been tried in this country before. It consists of the application of a preparation of coal tar, sulphur and sand to the ends of the pipe, so that when the preparation has hardened it forms the segment of a sphere—the spigot end an exterior, and the bell end an interior segment of a sphere. The process for applying this preparation is very simple, and a man of ordinary intelligence can master the art after a little practice. The surfaces of contact of the pipes are roughened by clipping and scraping them with a saw. The pipe is set upright (with the spigot end downward) into the female mold (represented in cut by *A*). The male mold is placed within the bell. In this position there are spaces between the roughened surfaces of the ends of the pipe and the turned segments of the metallic molds, which are filled with the patent preparation. The mixture is applied hot and allowed to cool, after which it is ready for laying. Hot linseed oil is applied to the surfaces of the joints to be consolidated, which softens the preparation. The joints soon cool and become solid and practically impervious. The spherical segments act like a ball-and-socket joint, allowing a change in direction of the pipe without diminishing the surface of contact. In a case where two laterals were run from a manhole, in opposite directions on the same street, one jointed with cement, the other with the Stanford preparation, and each having a line of drain tile beside it, it was found that although both tiles were running about the same amount of water, there was a small flow of water from the cement laid pipe, while the Stanford jointed pipe was perfectly dry. Col. Waring has secured the control of Mr. Stanford's patent for this country.

On both sides of laterals 4-in. Y's. were placed every 25 ft., from which 4-inch house connections were laid, extending to the curb line of the streets. These branch pipes were not laid until sometime after the laterals, in order that the tile might have a chance to drain the soil before making the excavations. In this flat district it has been found convenient in most cases to lay the termini of these house connection branches 3 ft. below the curb. Their locations and depths are recorded in the City Drainage Book, which, with a map of the sewer system, drawn to a scale of 40 ft. to the inch, will make any future reference for location exact and convenient.

In every case lines of 2-in. agricultural drain tile were laid on the same grade with, and besides the laterals. The level of the sub-soil water has been lowered to the grade of the tiles throughout the whole of the drained section of the city. In some locations where, in laying pipe, water was met from two to three feet below the surface of the street, subsequent excavations have shown that the soil has been drained to a depth of twelve to fifteen ft. It was found advisable to turn these tile drains into the sewers. In order to prevent any chance of a back-flow of sewerage into the tiles, 4-in. pipes were laid from the mains or sub-mains up to an elevation above the crowns of the pipe which the tile was to enter. They were also admitted to enter, at a safe elevation, into the manholes.

The minimum grade allowed for the laying of laterals was 1 in 300, and the maximum length allowed for a line of 6-in. pipe was 1,500 ft. The amount of household waste calculated to be provided for was 5 gallons per hour for each person, 6 persons to a house, and 1 house every 25 ft. The formula used for calculating the size of pipe was $D = \left(\frac{M^2}{1450\ S}\right)^{\frac{1}{5}}$, where M = cu. ft. per sec. D = diameter in ft. S = slope in fraction of a foot.

Norfolk being such a perfect savannah, it was necessary, in order to overcome the difficulty of not having a natural fall, to make deep excavations on the main lines. The difficulty of doing this will be realized when you consider that only about 4 to 5 ft. of the depth of excavation was through firm soil, the rest being through a very fine sand supercharged with water. The lateral pressure of this running sand was so great that it was necessary to put in shoring of 3 in. by 8 in. hard pine boards, and to brace them with stringers of 4 in. by 4 in. and 4 in. by 6 in. timbers, with 6 in. by 6 in. struts. In cases where material of smaller dimensions than those named were tried, they would often be snapped in two, allowing volumes of sand to enter the ditch. It was also found that 3 in. by 8 in. material was only serviceable in lengths of 12 ft.; therefore, in cuts deeper than 12 ft., double shoring was used.

At first mauls were used, assisted by water jets, in driving sheet piling. Our cheerful darkey laborers seemed to afford amusement as well as give their services to the public in the odd and skillful manner in which they handled their mauls. Crowds would stop to watch their actions, as they, with Indian club-like movements, swung their mauls, keeping in time with a weird darkey song, improvising as they went, some words or verses for the same.

I aint er gwine ter work on de sewage;
Shant strike er nudder lick I say,
White man gets er dollar en er haf,
Nigger gets er dollar er day,
Nigger gets er dollar er day.

It might be well to say that there is more poetry than truth in these words. Several months before the finishing of the work, a native stevedore, Mr. Daniel Knowles, invented an ingenious and useful pile driver, which was found to be especially adapted to driving sheet piling. It consists of a frame or scaffolding spanning the ditch—in the case of sheet pile driving, on the top of this scaffold is arranged a small truck, movable in either a longitudinal or lateral direction. Through this truck passes a vertical iron bar, upon which slides the ram. One end of the rod is placed upon the plank or pile to be driven, and by means of a fall passing through a sheave in the truck, the ram is raised upon the rod and allowed to fall upon an iron cap placed over the end of the plank or pile. The rod follows the pile as it descends, acting as a follower. The machines used by us gave universal satisfaction, enabling us to drive our sheeting quite rapidly, even through sand. We found them to be a great saving, as we were enabled to drive shoring before excavating, and thereby avoided that rise of sand in the bottom consequent upon having to keep grade of excavation at the foot of the piling. The business management of this invention has been put in the hands of the Norfolk House and Land Drainage Company.*

While the sheet piling was able to a great extent to keep out the sand, it was of course of no service in keeping out the sub-soil water. Ordinary tin suction pumps were used for that purpose in the shallower cuts, and the pulsometer in the deeper cuts. The pulsometer proved itself equal to the trying task of pumping this water, holding in suspension at least one-quarter of its bulk of sand. It may be of service to others using this valuable invention to know how we overcame a difficulty peculiar to the machine. In charging the machine with water, the old method of filling it with a bucket of water through a funnel became very unhandy in cases where the pulsometer was hung in inaccessible places; so we would heat the chambers with steam, and, disconnecting the steam hose, would quickly connect it with the water supply pipe. The cold water condenses the steam within the chamber and forms a partial vacuum, which draws in a full charge of water. The hose is again quickly connected with the steam pipe, and the pulsometer begins to breathe, and thus the engineer charges the machine without having to leave the boiler.

In the deeper cuts we used to great advantage

* NOTE.—The "Knowles" pile-driver has been used in Switzerland for centuries; the Japanese used the same appliance in driving piles at the house built by them at the "Centennial" in 1876.—ED.

the Carson excavating machine, which performed its functions easily and efficiently.

The treacherous nature of the soil made it advisable to place manholes at closer intervals than was at first planned. Within 3,600 ft. 10 manholes were placed on the main line. They were made without the usual silt-basin.

Because of the extreme flatness of Norfolk it was necessary to drain all of the sewerage of the city into a sump, and from there pump it into the Elizabeth River. A convenient location was selected, and a well 12 ft. in diameter and 23 ft. deep was sunk. This was effected by digging through the upper strata of soil until blue mud was reached. At this crisis an iron shoe was laid hung by four tie rods. On this shoe was built the brick wall of the well, which is 18 in. thick. By means of threads and nuts on the ends of the tie rods the shoe and its superstructure were admitted to sink evenly, until they reached the required depth, when the interior was excavated, and a beam flooring and concave brick bottom was inserted.

A three-foot brick culvert enters the well, into which all the mains are to enter.

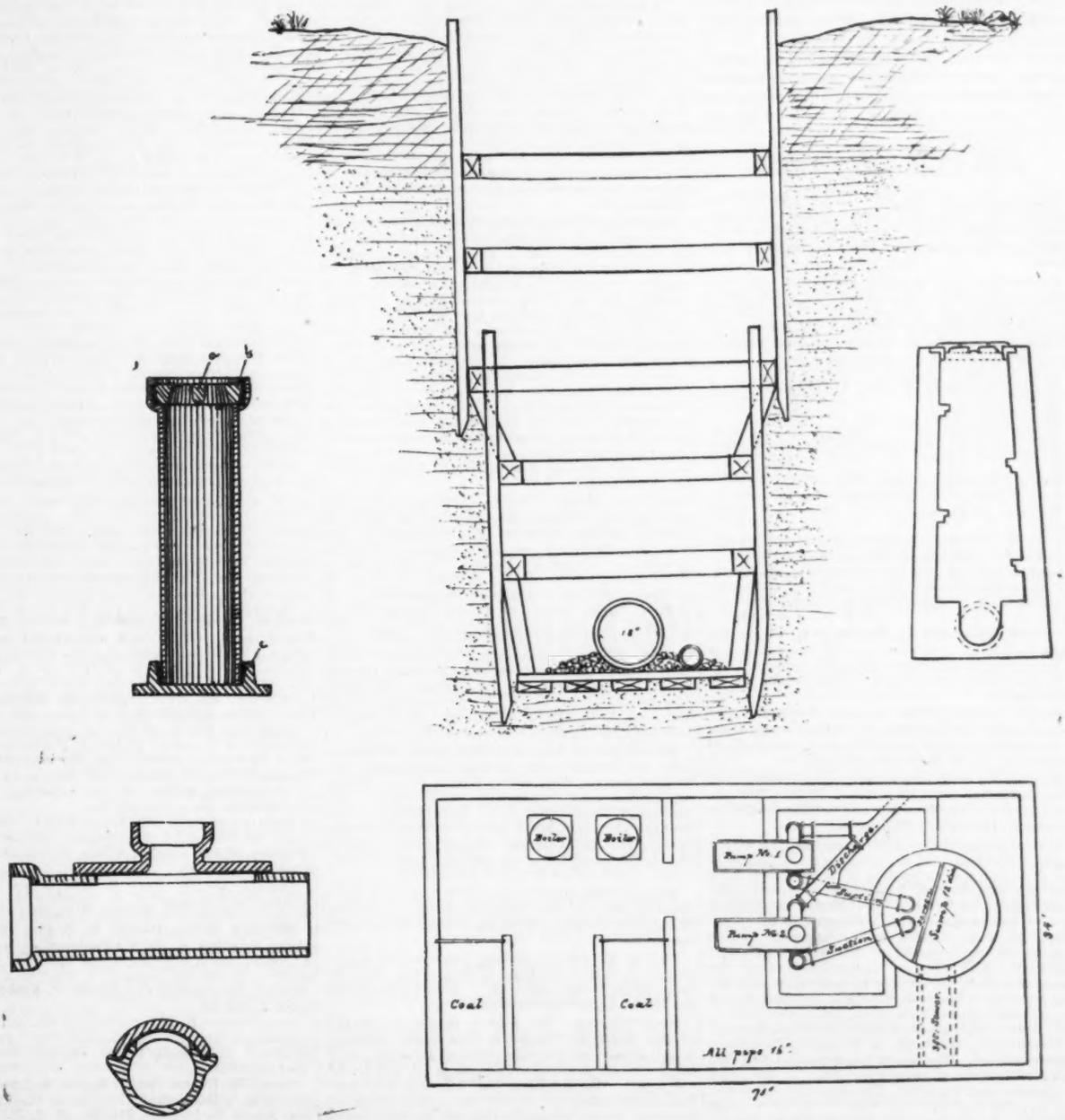
Two 3,000,000-gallon Davidson's steam pumps were erected upon piled and concreted foundations. Each pump has a separate 16-in. suction pipe entering the well, each representing a lift of 26 ft. The pumps thus far have proved themselves perfectly satisfactory, doing the difficult work of lifting a column of water 26 ft. high by 16 in. diameter without the use of foot-valves.

An iron screen made of half-inch iron rods placed vertically in a frame one-half inch apart is placed across the well to prevent such solid substances as may enter the sump from going into the suction pipes. All substances that would pass through a half-inch mesh will pass safely through the valve-ports of the pumps.

A 16-in. iron force main extends from the pumping station a distance of 1,492 feet to an outlet into the Elizabeth River. There is no fear of the point of discharge being a danger or a nuisance as in experiments recently tried it was found that on discoloring the water with prussiate of iron, in a flush tank in a remote part of the city, and by floating a rubber ball through, that the colored water and rubber ball entered the well, after having passed through all sizes of pipe used in the system, over a distance of a mile and a quarter, in so short a time that putrefaction could not even have commenced before it could have been discharged into the river, there to be immediately carried off by the tides. These facts, with the fact that it is diluted with not only the water from house waste but from flush tanks and sub-soil, compel us to believe that the discharge into the Elizabeth River of the sewerage of Norfolk will only be in the form of a fresh liquid, unobjectionable either sanitarily or olfactorily.

That this system of sewerage will be of the greatest benefit to Norfolk, there can be no doubt. Already property that was originally so boggy that owners would hardly dare to build frame buildings upon it, have been so well reclaimed by the tile drainage, that in many cases owners have applied for street lines, in order to build brick dwellings thereupon. In all parts of the drained section cellars once continually filled with water have been drained perfectly dry. But the greatest benefits will be the abolishment of all cesspools in Norfolk—thorough and strict sanitary ordinances—supervised plumbing, all of which, combined with the convenience that an efficient sewerage system affords, will well repay Norfolk for the slight outlay she has invested in its construction.

Of the 9 miles of pipe already laid 4.1 miles are in an incompleted section, requiring only 1.3 miles to complete it. It is most probable that the Coun-



cils will order at an early date the completion of this section.

The lethargy characteristic of many of the former Councils in Norfolk does not pervade the present one; but each meeting is enlivened with schemes for the improvement of the city. The acquisition of 5,000 inhabitants to her population within the last two years, the unusual number of buildings erected, the great improvements in commercial facilities and the promise of her soon becoming one of the greatest coaling ports in the country, have awakened the City Fathers to the importance of keeping apace with the progress of the world; and now that political freedom has a greater sway, the Northern capitalist is no longer scoffed at, but welcomed, and the old fogies, who would ever have maintained that the sanitary practices of their fathers were good enough for them, have been made to take a back seat to make room for men of progress.

NEWS OF THE WEEK.

ENCAUSTIC FLOOR TILING.—The contract for encaustic floor tiling for custom-house and post-office at Albany, N. Y., has been awarded to the American Encaustic Tile Company, New York, at $4,400.

CAST-IRON COLUMNS FOR GATEWAY OF NEW PENSION BUILDING.—The following is a synopsis of bids received and opened on April 28, 1883, by General M. C. Meigs, supervising engineer and architect, for furnishing sixteen cast-iron columns for gateways of new Pension Building:

J. M. Duclos, New York, $75 each.
Haugh, Ketchum & Co., Indianapolis, Ind., $767.68 for all.
James Perrottett, Columbia. Pa., $63 each.
Robert Wetherill & Co., Chester, Pa,, $78 each.
Snead & Co. Iron Works, Louisville, Ky., $46.50 each.
Phœnix Iron Co., Trenton, N. J., $1,627 for all.
Joseph Hall & Co., Richmond, Va., $53 each.
William H. Jackson & Co., New York, $59.68 each.
J. B. & J. M. Cornell, New York, $1,621 for all.
Cheney & Hewlett, New York, $1,056 for all.
Rittenhouse & Sons, Morristown, Pa., $65 each.
Central Iron Works, Brooklyn, N. Y., $40 each.
Mitchell & Shepherd, Philadelphia, Pa., $70 each.
George White & Co., Washington, D. C., $47 each.
W. Bollman, Baltimore, Md., $55 each.
C. A. Schneider's Sons, Washington, D. C., $45.41 each.

STEAM LAUNCH.—The contract for building a steam launch for the Revenue Marine service has been awarded to the Union Dry Dock Company, of Buffalo, N. Y., at their bid of $7,300.

MARBLE MANTELS, HEARTHS, AND SKIRTING FOR CUSTOM-HOUSE, ETC., AT ALBANY, N. Y.—The contract for this marble work has been awarded to Charles E. Hall & Co., of Boston.

THE WATERPHONE.—The committee on waterworks, Cincinnati, O., reported upon the matter of the Bell waterphone system of waste prevention that the subject had been under investigation since June 9, 1882, when Mr. Moore, superintendent of the water-works, submitted to the committee at their request the experience of the department, and results of the work with this invention, with the recommendation that the permanent right to use the invention be secured. The committee find that since the introduction of the waterphone in November, 1881, to April 1, 1883, over 6,000 abuses and leaks have been detected and corrected, resulting in a large reduction of water and fuel. The water consumption for 1882 was 1,260,000,000 of gallons less than for 1881, and no greater than for 1880. The decrease of water was so great that the large Shields engine was not called into use throughout 1882 (an unprecedented event in its history), thus giving a reserve power where none existed before. The good work done is shown by a comparative table of the first four months of 1879 to 1883 submitted in the report. The committee show that notwithstanding the increase since 1879 of 25 per cent. in water rents, 65 per cent. in metered water, 60 per cent. from hydraulic elevators, 10 per cent. in service branches, and 12 per cent. in miles of pipe, the water consumption is actually less now than in that year. They attribute the fact that the department was able to pass through the February flood without much inconvenience to the water consumers to the stoppage of water from large underground leaks rendered possible by the use of the waterphone. They state that the invention saves large sums of money formerly paid to inspectors, and by reducing the consumption of water gives a longer time for the settlement in the reservoirs and the furnishing of a clearer article. The condition of the water supply is now so changed that instead of being one of the most wasteful cities Cincinnati stands at the head as one of the most judicious users of water. Its pro rata now is about fifty-five gallons per inhabitant, while in Chicago it is 120 gallons; St. Louis, seventy-five gallons; Detroit, 130 gallons; Pittsburgh, 102 gallons; Boston, 100 gallons. Yet Cincinnati has a more satisfactory water supply than any other large city in general distribution, abundance for fire purposes, and large water pressure with more peculiar condition for waste in the old water pipes and fittings, the topography of the site and the incomparable demand by the hydraulic service (this alone uses over one eight of the actual consumption).

The committee conclude that the waterphone has provided a way for the suppression of waste in a cheap and efficacious manner, that the city has had the free use of it for over 16 months, deriving benefits in actual money returns far in excess of the sum asked for its permanent use. They therefore recommend that the proposition of the Bell Waterphone Company be accepted and the superintendent of the water-works be directed to make the purchase. The proposition of the Waterphone Company was to give the city, for $15,000 cash, the right to use the invention, including any improvements the company may hereafter become possessed of.

ALLEGHENY, PA., WATER-WORKS.—The committee of experts on pumping machinery for Allegheny, Pa., have reported in an eight-page pamphlet to the water committee of that city, advising the employment of the Gaskill pumping engine, manufactured by the Holly manufacturing company. In regard to water meters, they say: "We would also beg leave to report, as per instructions, regarding the use of water meters in other cities. The information given us regarding the use of meters in cities which we visited was uniform, and gave us the impression that their use is becoming more essential every day. All large manufactories are supplied by meter with water, and the use of same for domestic purposes is becoming more general, producing increased economy in the use of water, and causing a more equal distribution of the water rates."

ST. PAUL, Minn., May 3.—Articles of incorporation of the Minneapolis, St. Paul & Sea-coast Railway, with a capital of $15,000,000, were filed with the Secretary of State to-day. The incorporators are Alexander Ramsey, W. W. Kettson, H. H. Sibley, of St. Paul; Richard Chute, A. B. Nettleson, Judson N. Cross, of Minneapolis; E. H. Thayer, Q. S. Stacy, of Iowa; Ralph Haumb, Scranton, Ill., and J. D. Harvey, of Chicago. The road runs from Minneapolis, by way of St. Paul, striking the southern boundary of the State in Fillmore County and the Mississippi River at Canton, Iowa. The following are the officers: President, Alexander Ramsey; Vice-President and General Manager, A. H. Thayer; Treasurer, H. H. Sibley; Secretary and General Solicitor, J. N. Cross.

$10,047,000 TO IMPROVE VERA CRUZ HARBOR.—CITY OF MEXICO. May 3.—The government has made a contract with Butts, Caze & Co. of France, for harbor improvements at Vera Cruz. The northwest breakwater is to be completed in five years, and all the work is to be finished in twelve years. The government will pay the contractors 10,047,000 Mexican silver dollars in weekly payments of $10,000 as the work proceeds.

BRIDGE OVER THE HUDSON AT STORM KING MT.—ALBANY, May 3.—The bill authorizing the building of the above bridge passed the Assembly by a large majority.

THE N. Y. AQUEDUCT BILL PASSED both houses on May 3, with only three citizens, viz., Geo. W. Lane, Wm. Dowd and Jas. C. Spencer, named in the bill as Aqueduct Commissioners.

HIGH TRESTLE.—The highest trestle on the line of the Northern Pacific is that across Coriacan defile, about twelve miles west of Missoula, Montana. When finished the track level will be 300 feet in air. The length of this trestle is 2,400 feet. The height thus far is 125 feet. The people of Missuola closely estimate that the western end of the Northern Pacific will reach that city by July 1.

NEW CONSTRUCTIONS.—*From our Friday exchanges.*—Bennettsville, S. C., is to have a $20,000 court-house. Quincy, Mass.; Willimantic, Conn.; Columbia, Tenn.; Brattleboro, Vt.; Lansingburgh, N. Y.; Safford Springs, Conn.; West Bay City, Mich., are building or preparing to build waterworks. Laredo, Tex., is advertising in Galveston *News* for proposals to build a $25,000 market-house and hall. A large force, belonging to McGavock & Carlisle, who have heretofore been working on the Rio Grande & Pecos road, Tex., have gone to commence work on a large contract secured by these gentlemen on the Mexican Central. They have four tunnels through rock to make. The Fort Worth (Tex.) Water-Works Company have concluded to increase the size of the crib imbedded in the Trinity River to a capacity to furnish water for a city of 50,000 people. Also three more miles of mains will soon be laid. City Engineer Tower, of Holyoke, Mass., has finished the plans for the new Cabot street sewer and the laterals, and the advertising for proposals for the brick-work will be acted on at the next meeting of the committee on sewers and drains. The trunk sewer will be 2,000 ft. long and, next to the big Frost street sewer, will be one of the most important jobs of the season.

H. W. S. Cleveland, the landscape architect, is employed to plan the grounds for the Minnesota State university at Minneapolis, W. D. Washburn property, and to assist the park commission. Petersburg, Va., is to create the office of City Engineer within the month, and to discuss the subject of buiding new gas works. Lincoln, Neb., has just paid for making a city well, giving the contractor $2,500 in bonds, and now proposes to test the well and see whether the supply is sufficient. The Canadian Government is advertising the construction of two basins in the Lachine canal at Montreal. Proposals received to June 6th. The Joliet Water-Works company of Will County, Ill., capital stock $150,000; incorporators, C. Knowlton, L. L. Freeman, and William G. Hawks, was incorporated 30th ult. WINNIPEG, Manitoba, April 30.—A. B. Stickney, vice-president of the Minneapolis & St. Louis Railway, is here with the object, it is said, of obtaining a contract to construct the Portage, Westbourn & Northwest Railway from Gladstone to Prince Albert on the Big Saskatckewan, a distance of five hundred miles. By resolution the salaries were fixed for the ensuing year by the Town of Lake, Ill.: Chief engineer, $345 per month; first assistant engineer, $125; second assistant engineer, $100; draughtsman, $100; rodman, $60; deputy health commissioner, $75; sanitary policemen, $75; town attorney, $250; prosecuting attorney, $50; electrician, $100; sewer inspector, $75; captain of police, $100; sergeants, $100; roundsmen, $85; patrolmen, $75; fire marshal, $150; enginer of fire department, $100; captain of fire company No. 5, $100; pipemen, drivers and stokers, $70; captains of hose companies, $65; assistant, $60; chief engineer of water-works, $125; assistant, $90; firemen at water-works, $60; laborers, $50; water collector, $110; tappers with horse, $120; water inspector and repairers, $75; accountant and cashier of water department, $125; roadmasters, $90.

RECONSTRUCTION OF THE SMITHSONIAN INSTITUTE.—Bids for iron floors, iron stairs, brick work, cut stone, carpenters' work, slating and plastering, for the reconstruction of the eastern portion of Smithsonian Institution were opened at the institution at noon, April 26. No awards will be made for a day or two. The bidders were as follows:

Brickwork—A. M. Colwell, $16,950; D. T. Cissell, $13,495; Davidson & Marshall, $27,475 (including other work); G. O. Cook, $45,000 for the entire work, $11,900 for brickwork; Davidson & Marshall, $15,757; John H. Cissell, $18,700; W. A. Wilson & Co., $8,449.08; F. A. Clarkson & Co., $16,000; John McCarthy, $14,611; Aug. Davis, $13,631; W. J. Kenderdine, $13,470; Jno. M. Lloyd, $10,500.

Carpenter Work—Holtzclaw & Hepburn, $5,453; Davidson & Marshall, $4,923; A. T. Phillips, $6,100; D. J McCarthy, $6,961; John Westerfield, $7,176; Daniel & Driscoll, $6,085; C. T. Smith, $4,699; W. J. Kenerdine, $5,490; W. B. Downing & Bro., $4,896; Not. Anderson, $6,840.

Plastering—S. E. Rabbitt, $1,596; G. W. Harkness, $1,800; John Humphrey, $1,700; James Hughes, $1,532; John S. White, $1,853; John R. P. Carpenter, $1,650.

Slating—G. B. Clark & Son, $9 for Bangor, $10.50 Peach Bottom; C. J. Fanning, $7.45; John O. Jones, $9 Bangor. $10 Peach Bottom.

For Iron Stairs—George E. Noyes, $2,054.99; Pettit & Dripps, $1,302.65; Peckham & Middleton, $1,439.64; George White & Co., $948; E. N. Gray & Co., $1,737.52; Samuel J. Cresswell, $2,000; Bartlett, Hayward & Co., $2,365; C. A. Schneider's Sons, $1,511.33.

Iron Beams—E. N. Gray & Co., $8,156.69; C. A. Schneider's Sons, $8,219. Bartlett, Hayward & Co., $9,500; J. H. McGill, $8,789; Phœnix Iron Company, $12,175.

Stone—R. Evans, $5,157; Taylor & Low, $7,300; Davidson & Marshall, $7,747; John Walker, $10,300; James Viehmeyer, $11,500; M. A. Macgowan, $10,100; Burns & Son, $6,900; Richard Rothwell, $5,974; Middleton, Lane & Co., $8,245; William Bradley & Son, $5,600.

TOPOLOBAMPO.—Mr. A. K. Owen, chief engineer of the Texas, Topolobampo & Pacific Railroad, being in New Orleans a few days since, submitted to an interview. He said: The line of the Topolobampo Pacific from the Gulf of California to the Rio Grande has been for the most part determined upon, and the location and construction will begin and continue together. Our examinations in the Sierra Madre of Sinaloa and Chihuahua have extended over seventeen hundred miles; and the lines reported by our engineers through the coast lands of Sinaloa and Sonora, and across the plateaux Chihuahua and Coahuila cover a distance of over two thousand miles. The Topolobampo system of railroad lines, trunk and branches, will have a length of about two thousand miles—running from Mazatlan to Alamos, from Topolobampo to Presidio del Rio Grande, from near Santa Rosa-

lia to Presidio del Norte; together with local branches to coal and silver deposits, etc. The company will, probably, build and equip the first forty miles, from Topolobampo to the silver mines and sugar fields of the valley of the Rio Fuerte, without placing any bonds; and while this is being done the negotiations already commenced with certain parties here and in Europe can be consummated. The Topolobampo Pacific will be virtually a southern trunk line to the western ocean. No truly east and west line can be south of it; and every line north must be longer, whether it runs from Quebec to Puget Sound, from Duluth to the Columbia River, New York to San Francisco, or from New Orleans to San Diego. San Francisco lies 600 miles south of the Columbia River, San Diego 441 miles south of San Francisco, and Topolobampo 650 miles in a direct line, 936 miles via Cape San Lucas—the southern point of Lower California—south of San Diego; while Acapulco lies 740 miles south of Topolobampo, too far to the southward, however, for a possible trans-continental highway.

A NEW EGYPTIAN CANAL.—ALEXANDRA, April 27.—Two schemes are afloat for the construction of a canal from Alexandria to Suez, one via Cairo and the other Pender's scheme, avoiding the capital city.

CHICAGO'S CABLE RAILROAD, with 20 miles of track and 174 cars, and the steam engines does the work of 1,970 horses. The running time on four miles, between the court-house and the city limits, is 25 minutes less than when horses were used.

THE HAWLEY & PITTSBURGH R. R.—The contract has been let for building a new railroad from Hawley, Wayne County, to Pittston, Luzerne County. It is expected that the road will be completed in ten months. Two thousand men will be set to work in two weeks.

THE TEXAS CATTLE SHIPMENT.—80,000 head of cattle are on their way to the East, by way of the International & Great Northern, the Gulf, Colorado & Santa Fe, and Fort Worth & Denver Railroads. The old time "drive" is a thing of the past, the railroads doing the transportation at $35 per car.

THE FORT WORTH WATER-WORKS were officially tested April 25, fourteen 1¼ in. streams being thrown at one time 100 ft. high. W. M. Johnson is City Engineer, and A. M. Wheless Superintendent of water-works.

TEXAS CEMENT.—The Austin Capitol Commissioners have changed the clause in the New Capitol specifications, so as to permit the use of any standard cement. The original contract called for "Texas cement."

PURE WATER FOR BOSTON. — The Committee on Water recommends an expenditure of $160,000 at the Farm Pond conduit; $80,000 to deepen the edges of Basin 2; $125,000 for same work on Basin 3; $214,000 to remove the muck and put in order the Ashland new reservoir; also $50,000 to purchase 2,000 recording meters for use in houses to reduce waste; $25,000 for a number of Deacon Waste Water Detectors; and $20,000 to pay twenty inspectors. Total, $716,000.

YELLOWSTONE PARK BRANCH.—LIVINGSTONE Mont., April 26.—The Park Branch Railroad from this point to Mammoth Springs is being pushed through rapidly. The tracklaying will begin as soon as the grading advances far enough to keep clear of the tracklayers. The line is to be fifty-three miles in length, and Winston Bros. & Clark, contractors, expect to finish it in ninety days. The Park Improvement company is pushing work on the hotel at Mammoth Springs, and will soon be in readiness for visitors to this wonderland of America.

N. Y. & NEW ENG. SECOND TRACK.—James Savage of Augusta, Maine, has taken a contract to do the grading and masonry for the second track upon the New York & New England, from Blackstone to Willimantic, about fifty miles, to be completed November 1, next.

A $50,000 SCHOOL BUILDING FOR BRATTLEBORO, VT.—The school committee has begun preparations for erecting a new school building at above cost. It is to be 96 by 124 ft. two-story high with mansard roof, to be built of brick.

A MAINE RAILROAD PROJECT.—A contract has been executed for the rebuilding of the Waterloo & Magog R. R., 23 miles long, and for its extension from Magog to Lennoxville, a distance of 18 miles.

A NEW PACIFIC ROAD.—NEW YORK, April 25.—A new Pacific railroad enterprise, backed by English capitalists, is reported as having been organized. It is called the United States Central Railroad, and is to extend from Denver to San Francisco, about 1,200 miles. The stock will be issued $50,000 per mile, and $40,000 in bonds. Seven railroad charters in different States and Territories have been secured by the promoters of this new scheme, who intend to consolidate all of them.

THE FATTENING TENDENCIES OF U. S. BONDS.—William H. Vanderbilt is one of the fat men who is anxious to grow lean, but who will not heed anybody's advice. He has ransacked the habitable and uninhabitable globe for anti-fat remedies, and his stable men complain that he is filling their quarters with these remedies. Mr. Vanderbilt is an enormous eater. Three tenderloin steaks, one dozen hard-boiled eggs, coffee and cakes for six, and a few pieces of pie form a light breakfast for him. His physicians have urged him to cut down his bill of fare if he desires to be less fat than he is, but he brooks no interference with his appetite. His physicians rejoice over the rumor that he is to "back" an operatic manager, and say that such a course will surely play havoc with his flesh.

THE HANNIBAL & ST. JOSEPH R. R. is sold by the Gould syndicate to the Chicago, Burlington & Quincy R. R. Two-thirds of the preferred stock and 75,000 shares common stock were represented in the transaction.

ELECTRIC LIGHT IN NASHVILLE, TENN.—The people are to vote on the question of electric light at $43,000 per annum, or gas at reduced rates.

VITRIFIED PIPE.—The Assembly bill amending the laws so as to permit the use of vitrified pipe in draining buildings in New York city was passed on the 30th ult. Mr. Grady explained this bill, and briefly urged its passage; it passed by 21 votes, no one voting in the negative.

RAIL MILL ORDERS TO 15TH.—

	Tons.
Lackawana Coal and Iron	40,000
Cleveland Rolling Mills	20,000
Edgar Thomson Works	70,000
Joliet Works	25,000
Vulcan Works	40,000
Bethlehem Iron Works	90,000
Scranton Company	40,000
Pittsburgh Bessemer Company	40,000
Pittsburgh Steel Company	65,000
Union Mills	20,000
Rensselaer Company	40,000
Cambria Iron	60,000
North Chicago Mills	65,000
Total	615,000

AN ELMIRA STORY ABOUT THE BRIDGE.—An Elmiran, while in New York last week, crossed the wonderful Brooklyn bridge. Some idea of the height of this celebrated bridge may be gained by his assertion that viewed from the bridge a large ocean vessel looks small enough to be placed in a person's vest pocket.—*Elmira Gazette.*

THE DULUTH & IRON RANGE RAILROAD COMPANY held a meeting April 26, and elected the following: President, C. Tower, Jr.; vice-president and treasurer, George C. Stone; secretary and chief engineer, H. S. Lee; assistant superintendent, George H. White; assistant engineer. J. B. Fish. An auditor has not yet been selected. All the offices of the company except that of vice-president and treasurer will be in Duluth. Mr. Stone will have his office in St. Paul. Construction will begin in about three weeks. There are a number of contractors in the city who are anxious to bid for the construction work.

SUCCESSFUL STRIKE AT DALLAS. — ST. LOUIS, April 25.—The bricklayers of Dallas, Tex., struck for an increase of wages from $4 to $5 per day, and the contractors, owing to the pressure of work, acceded to the demand. The carpenters also demanded an advance from $2.50 to $3, which was agreed to.

PALMER WATER COMPANY.—The Massachusetts Senate adopted, without debate, the House amendments to the bill incorporating the Palmer Water Company.

A PENNA. R. R. DIVIDEND was declared on May 1 upon a semi-annual dividend of 2 per cent. in cash, 2 per cent. in cash or scrip and 4 per cent. in stock.

STORAGE RESERVOIR.—The contract for constructing the New Milford storage reservoir dam was awarded to Bartram & Squires, of Sharon, Conn., at six dollars ($6) per cubic yard, they to do what excavation may be required by the engineer. Solid masonry, 35 ft. high, 22 ft. at base.

NEWTOWN (CONN.) WATER-WORKS.—An act of incorporation into a borough of the village of Newtown, Conn., passed the State Legislature last week, the object in view being the construction of water-works for the village. Surveys are now being made for the work under the direction of B. F. Hull, civil and hydraulic engineer, of Bridgeport, Conn.

THE WARREN & FARNSWORTH Valley Railroad, in Warren County, Pa., will be extended down Minister Creek to Balltown, and from the mouth of Minister up to Sheriff's, where it will be met by a branch of the Pittsburgh, Bradford & Buffalo Railroad. It will open for business the new Balltown oil territory.

R. R. CONTRACTS.—PHILADELPHIA, April 30.—The contracts for grading and masonry on the Philadelphia, Norristown & Phœnixville and the Philadelphia, Pottstown & Reading railroads (branches of the Pennsylvania Railroad) have been awarded, and the work of the entire line to Phœnixville will be begun soon.

A NEW EAST RIVER BRIDGE TALKED OF.—Certain citizens of New York and Brooklyn have under consideration a new bridge or tunnel across the East River, starting from South Sixth street, Williamsburgh, to a point in New York near Grand street. The cost is estimated at $12,000,000.

A TRESTLE BRIDGE 21 MILES LONG.—The New Orleans & North Eastern R. R. crosses Lake Ponchartrain on trestle work which when completed will be 21 miles long. The piles average 60 ft. in length, and are driven 40 ft. in the mud; the bents are 15 ft. apart; 15,000,000 ft. B. M. of timber will be required, and 32,641 piles.

THE CANADIAN PACIFIC R. R. has been granted power to lease the line of the Credit Valley, Atlantic & Northwestern and Ontario & Quebec railway companies, to complete a through route from Montreal to Credit Valley.

THE HOOSAC TUNNEL.—$265,000 has been appropriated by the Massachusetts Legislature to finish it.

THE HIGHEST BRIDGE IN THE WORLD is said to be the railway viaduct of Garabit in France, now being erected over a river in the department of Cantal. The bridge has a total length of about 1,880 feet, and near the middle of the great center arch, which is one of the noteworthy features of the structure, the height from the bed of the river to the rail is 413 feet. The viaduct was commenced in 1881, and is to be completed next year. The cost is estimated at about $600,000.

THE HOLLY MANUFACTURING CO. has been awarded a contract by Nashville, Tenn., for a ten million gallon engine, at $90,000. The entire text of the contract is published in Nashville *Daily American*, 26th ult.

THE NICKEL PLATE'S ENTRANCE INTO CHICAGO.—CHICAGO, Ill., April 29.—The Nickel Plate Road completed its crossing of the Fort Wayne tracks to-day, and was proceeding to cross Seventy-sixth street to its connection with the Lake Shore tracks when a squad of Hyde Park police appeared and put a stop to the work on the ground that no ordinance had been passed by the village trustees giving the road the right of way across the street.

THE BERLIN ELEVATED RAILROAD is carried upon a brick, stone and concrete structure 20 feet high has two tracks of standard gauge, and does not follow the streets but cuts "across lots." The stations are roomy glass and iron buildings, into which the trains run; there is scarcely any inconvenience from noise or dirt.

THE SAHARA INLAND SEA.—Six Algerian engineers, who have been consulted by M. de Lesseps on the inland sea scheme, report that the cutting could be made within five years, at a cost of $30,000,000. An average width of 80 or 100 feet would be sufficient, as the current would widen the canal; and since it would be nearly in a straight line, the navigation would be devoid of difficulty. A vast tract of country, lacking only moisture to become very productive, would thus be brought under cultivation.

HIGH TRESTLE WORK ON N. PACIFIC R. R.—The trestle on the Northern Pacific across Corsican defile, twelve miles west of Missoula, when completed, will be 300 feet in the air; the length of the trestle is 2,400 feet.

THE COLUMBUS SEWER PIPE WORKS were burned in Columbus, Ohio, this week; loss, $50,000; insurance, $30,000.

PROPOSED BRIDGE ACROSS THE COLORADO RIVER.—LA GRANGE, April 25.—Our town is being entertained by the presence of quite a number of civil engineers, representing some of the leading bridge companies of the United States, who are here for the purpose of bidding on the large iron bridge which our people propose building across the Colorado River. Mr. L. M. Lynch, former engineer of the Santa Fe Railroad, has arrived. He has been engaged by our people as an expert to consult with in regard to the location and construction of the bridge.

PROFITS OF COTTON SEED OIL MILLS.—Messrs. McKee Brothers, civil mining and mechanical engineers, who for the past five years have been actively engaged in the construction of cotton seed oil mills and refineries in Tennessee and Arkansas, make some remarkable statements in regard to the profits of the business. They say that an investment of from $12,000 to $14,000 in a yellow summer refinery will return a clean $300 per day for every day the refinery runs, if the refiner understands his business and does not own an interest in a neighboring soap factory. The profits from making cold pressed oils or white winter, the highest grade of cotton seed oil, even surpass those derived from making yellow summer.

A NEW DOCK AT ST. JOHN'S, NEWFOUNDLAND.—The late Newfoundland Legislature sanctioned the construction of a large wooden dock in the harbor of St. John's, to cost $550,000, and to be completed within two years. The contractors agreed to lease the dock when built for ten years at $15,000 per annum.

TESTING A NEW STYLE LOCOMOTIVE.—An exhibition of the "smokeless and sparkless" locomotive Robert L. Walker was given on the Eastern Railroad Saturday to nearly one hundred prominent railroad men of the country. Two cars were attached to the regular 11:15 a. m. outward train, making seven cars in all, and the front door of the foremost car was left open during the run to Salem and back that the presence of cinders might be readily discovered.

LIFE-SAVING STATION, BARNEGAT, N. J.—The contract for building this station has been awarded to Joseph Butcher, Camden, N. J., at his bid of $3,072.

SHEET COPPER FOR COURT-HOUSE AND POST-OFFICE, TOPEKA, KANSAS.—The contract for this copper has been awarded to Park, Scott & Co., at 32 56-100 cents per lb. for 12 oz.; 360 sheets, 24x38, tinned on both sides, 30 cents for 14 oz.; 380 sheets 28 cents for 6 sheets 16 oz.

A FIRE-PROOF CELLULOID.—A new celluloid, said to be fire-proof, and suitable as a substitute for ivory, is thus made: a solution is prepared of 200 parts of casein in 50 parts of ammonia and 400 of water, or 150 parts of albumen in 400 of water. To the solution the following are added: Quicklime 240 parts, acetate of alumina, 150 parts; alum, 50 parts; sulphate of lime, 1,200 parts; oil, 100 parts. The oil is to be mixed in the last. When dark objects are to be made, from 75 to 100 parts of tannin are substituted for the acetate of alumina. When the mixture has been well kneaded together, and made into a smooth paste, it is passed through rollers to form plates of the desired shape. These are dried and pressed into metallic molds previously heated, or they may be reduced to a very fine powder, which is introduced into heated molds and submitted to strong pressure. The objects are afterward dipped into the following bath: Water, 100 parts; white glue, 6 parts; phosphoric acid, 10 parts. Finally, they are dried, polished and varnished with shellac.

THE CHIPPEWA FALLS & SOUTHERN R. R. (Wis.) was incorporated April 24, with a capital stock of $100,000, to run from Chippewa Falls to Eau Claire.

THE LARGEST IRON BRIDGE in the United States will be the one now building over the Monongahela River at Homestead, Pa.; it is over one mile in length.

HOW VANDERBILT TAKES MEDICINE AND PLAYS POKER.—William H. Vanderbilt is only sixty-two years old. Not exactly a hypochondriac, he is so much delighted with this life and his large revenue in it that he gives much of his time up to doctors, and annoys his friends by his sensitiveness about his health. With the health of a bull, he has the nerves of a woman. For some time past he has had the movement cure, or the rubbing cure, whatever it may be called, involving somebody to come and scrub his muscles over and delude him with the idea that friction is health. He is also a victim of the homeopathic people, and bothers his friends by taking out of his pocket papers of number one, number three and number nine, and swallowing them in the midst of his ordinary social demonstrations. William K. is the Don Cameron of the Vanderbilts. When he sits down to play poker with his father he makes his sire ante up every time. "Father," he says, "you have not anted." "Yes, I have, William," says the old man. "I beg your pardon," says the son, "you anted last time, but not this time." Then the old man begs the son's pardon and antes up.—*Cincinnati Enquirer.*

THE HIGHEST GROUND IN FLORIDA is in the neighborhood of Lake Funiak, 160 ft. above tide level.

THE FRANKLIN WATER CO. (Mass.) is incorporated with a capital of $75,000.

A PACIFIC COAST MINING EXPOSITION is in process of being arranged for during the coming summer at San Francisco. A citizens' committee has been already formed to this end.

THE VESUVIUS RAILROAD COMPANY publishes the following circular: "Those who don't wish to start from Naples at the indicated hours can require a special departure, but have to pay at least three seats of carriage." All despatch is used in such cases, for "carriages belonging to the Wire Railway Company are only allowed to stop on their way for momentaneous repose of the horses." And then we come to the pleasant announcement: "No drinking money is due to coachman." "At the inferior station on Mount Vesuvius passengers will receive a contre-ticket and conformly to its order's number they will take place in the train. The train is composed of ten passengers. Those who willingly lose their turn can profit of the next train always when there is an empty seat, but cannot pretend a special train." Comfort is attended to. "Chairs from the superior station to the crater can be haved fer Lire five and Lire three to circulate round the crater."

AMERICAN ENGINEERING ABROAD.—The story is told that twenty years ago one of our New England railroad companies did not dare to adopt the plans of its chief engineer for an iron bridge until they had been sent over to England and approved by experts there. Last year one of the leading English engineers designed a bridge in which there were two spans of 1,700 ft. each, or 100 ft. more than that of the East River Bridge. This design has been most severely attacked by the Astronomer Royal, and a good deal of capital made out of it. The engineer, Mr. Baker, in replying to it, says: "As a sample of foreign opinion, I would quote that of Mr. T. C. Clarke, of Clarke, Reeves & Co., the eminent American engineer and contractor, who has built more big bridges himself than are to be found in the whole of this country, and who has just completed a viaduct 301 ft. in height, by far the tallest in the world. Referring to the proposed bridge he writes: 'If my opinion is of any value, I wish to say that a more thoroughly practical and well-considered design I have never seen.' I need hardly say that the opinion of such a man has far more weight than that of an army of amateurs." This, as the *Railroad Gazette* says, is a very gratifying evidence that American engineering is growing in its reputation abroad.—*Mechanics.*

THE OREGON CENTRAL R. R. is to be completed from Corvallis to its junction with the Oregon and California Railroad at Junction City. The length of the road is 25 miles; to be finished this year.

ARTESIAN WELLS ON THE UNION PACIFIC have partially solved the problem of obtaining pure water in the alkali regions; clear and wholesome water is found at from 250 to 900 feet. At Rock Springs the company still hauls water by train to supply 1,500 people; at Table Rock a well 1,450 feet deep has failed to reach good water. These are the exceptional cases.

SOME LARGE BELLS.—In making bells loudness rather than pitch is the object, as a sound can be conveyed to a much further extent. This accounts for the enormous weight of some of the largest bells. St. Paul's, London, weighs 13,000 pounds, and the bell at Antwerp, 16,000 pounds; Oxford, 17,000 pounds; the bell at Rome, 19,000 pounds; Mechlin, 20,000 pounds; Bruges, 23,000 pounds; York, 24,000 pounds; Cologne, 25,000 pounds; Montreal, 29,000 pounds; Erfurt, 30,000 pounds; "Big Ben," at the House of Parliament, 31,000 pounds; Sens, 34,000 pounds; Vienna, 40,000 pounds; Novgorod, 69,000 pounds; Pekin, 139,000 pounds; Moscow, 141,000 pounds. But as yet the greatest bell ever known is another famous Moscow bell, which was never hung. It was cast by the order of Empress Anne, in 1653. It lies broken on the ground, and is estimated to weigh 443,872 pounds. It is nineteen feet high and measures around the margin sixty-four feet.

EUROPEAN LOCOMOTIVE WORKS.—Germany now possesses twenty-two locomotive works, four of which manufacture engines for narrow-gauge roads. The annual production of the eighteen others is about 1,730 engines. Prussia alone turns out 1,060 locomotives. Berlin has three shops, making 450; Hanover has one establishment which furnishes 200 locomotives, and Hesse-Nassau one, which manufactures 150 annually. The annual production for narrow-gauge roads is seventy. Switzerland can make 350.

THE TEHAUNTEPEC SHIP RAILROAD is reported to have been officially inaugurated on April 30, at Mineatilla, the northern terminus of the ship railway on the Atlantic side.

NEGOTIATIONS FOR LEASE OF JERSEY CENTRAL TO READING R. R., are said to be approaching a conclusion. The question of absolute control will be decided at the meeting to be held May 11. It is understood that the Gowen-Garrett party will hold a large majority.

THE SHIP RAILWAY.—The St. Louis *Globe-Democrat* of the 17th, says: The proposed ship railway across the Isthmus of Tehuantepec has not been abandoned, as many suppose. Capt. James B. Eads, its projector, has returned home, and from him it was learned that work is being vigorously prosecuted, and that the massive railroad will be finished long before De Lesseps' Panama Canal is opened. Six weeks ago a strong syndicate was formed for the purpose of beginning the work and making additional surveys to see if the route selected could be improved upon. Four parties of engineers are already in the field, under the general charge of Mr. Van Bracklin, and a large force of laborers and mechanics is engaged in construction. The neighborhood of Minatitlan, on the Coatzacoalcos River, has been selected as the northern terminus of the railway. The surveys of the northern terminal sections have been filed with the government of Mexico and approved by its officers. Mexico has appointed one of its most distinguished engineers to be associated with the work, in accordance with the terms of the concession. He is now at Salina Cruz, on the Pacific, and has been ordered to repair to Minatitlan. E. L. Corthell, who was Capt. Eads' chief engineer in the construction of the Mississippi River jetties, is chief engineer. Sir Edward Reed and John Fowler, of London, and Capt. Eads will be consulting engineers. Col. James Andrews, who built the jetties, and Hon. A. G. Cochran, Capt. Eads' attorney, have been in London the past thirty days to complete arrangements for the advancement of the project. The road will be constructed to carry ships and cargoes of the gross weight of five thousand tons, which will accommodate ninety per cent. of the tonnage of the world. The capitalists already interested in the enterprise reside at London, New York, St. Louis and New Orleans. In speaking of the prospects of completing the road, Capt. Eads said he had not the slightest doubt of the work being finished and the line open for traffic before the end of 1887.

IRON AND METAL MARKETS.

PHILADELPHIA, MAY 3.

The decline in pig iron quotations has brought quite a number of buyers into the market, and since Monday large and small transactions have been taking place almost daily on a basis of $21.50@$22 for No. 1 foundry; $19.50@$20.50 for No. 2, and $18.50@$20.50 for Mill irons, all delivery quotations. The special brands which have been held at $21 are now selling at furnace, and good brands are selling at $18. A large amount of iron has been offered and negotiations are in hand which will likely result in business. The downward tendency has reached its probable lowest limits. A number of furnaces will go out of blast in a few days. Stocks are sufficiently large to meet present requirements at present rate of consumption. Foreign irons are without any activity whatever; an occasional lot is heard of. Buyers of Bessemer are waiting for a decline, and the best offers heard of are $21. The finished iron market is without any greater activity for a decline in consequence of the drop in pig iron, and hence they are covering only present requirements. Stocks are low in second hands. Manufacturers look for an improvement as soon as buyers are satisfied no further reduction will take place. Refined merchant bars are selling at 2.10@2.20c. Common iron for car use, 1.80@1.90c. Nails are moving very freely and assortments are well maintained. Construction iron is under better inquiry this week and a better feeling prevails. Large lots of steel rails have been placed and prices are somewhat firmer at $39@$40. Old material is unusually dull. Buyers are in the market but sales are exceptional.

PITTSBURGH, MAY 3.

The recent turn of affairs between iron makers and workmen is unsatisfactory. A restriction of production will be advantageous, and has been foreseen by the older heads in the trade. Pig iron will decline still further, and at present writing demand is very dull especially for mill use. Foundry irons will continue in fair demand at present quotations. Muck bars are selling at $34. The nail makers have agreed to maintain card rates and selling prices, which are $3 in car-load lots to $3.20 in small lots. Merchant bar is $1.90; common, $1.75. Several inquiries are in hand for structural and plate iron. Large orders are placed at concessions. Quotations for small lots are unchanged. The steel mills are receiving inquiries for summer and fall shipments, and the recent orders placed were at $39.50. Small railway material is under good inquiry and orders are in hand for six weeks to come. Two or three large sales of old rails were closed at $25. Strikes are the order of the day here.

CHICAGO, MAY 3.

The only change in the situation in this market is in inquiries for summer requirements. Offers for large lots of crude and finished iron and for machinery steel are in hand at concessions from current rates. Consumptive requirements are improving and consumers desire to cover wants for the next ninety days. Merchant iron is offered at 2.30c., and the supply is ample. Offers have been received from buyers at 2.10c. and negotiations are pending with outside manufacturers at this figure. Competition is active and a large volume of business is quite probable in a few days. Lake Superior pig iron is selling in retail lots at 50 cents off last week. Foreign irons are dull and light in stock Steel rails are quoted at $41, and a fair amount of business was transacted for summer delivery. The agricultural implement works and machine shops are placing orders for summer requirements, and are ready to purchase more freely on their own terms.

LOUISVILLE, MAY 3.

Hanging Rock irons are in active demand at $25 for foundry and at $17.50@$20 for mill irons. Car wheel irons are moving freely in small lots at $26@$32, according to quantity. The mills along the Ohio Valley have a fair amount of summer work on hand, and are therefore buying with more confidence to cover wants. Merchant bar and nails are moving freely at 2.15@2.25c. for bars and $3@$3.25 for nails. Building operations are active and the impetus given to general trade by the projected Southern Exposition is being felt in various channels. Southern charcoal and coke irons are being offered quite freely, as makers are anxious to realize.